ELECTRICAL REVIEW

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A Going Concern

Manufacturers' Adaptability to Wartime Needs

JUDGING from the reports received by us from electrical manufacturers and summarised in recent issues, the productive capacity of the electrical industry has been very fully utilised during the past year. Apart from an appreciable amount of work of a special character required by the Service Departments, the principal difference the war has made, technically speaking, is in the need to concentrate attention on things of the moment or very near future.

Research into industrial problems has had generally to be directed to improvements in existing designs with a view to simplifying manufacture, economising materials, finding substitutes for materials in short supply and facilitating installation and maintenance of plant—all without holding up output. To give prominence to this aspect is not to ignore the great engineering ability that has been devoted to preparing special designs to meet peculiar conditions.

Large Power Plant

An example of present tendencies is provided by the considerable number of turbo-alternators that have been built for up to 50,000 kW and transformers up to 60,000-kVA to deal with the rapid growth of the load provided by war industries both at home and abroad ; their designs follow well-established lines without significant modifications. On the other hand, unusually heavy calls for certain kinds of plant furnish apt illustrations of present trends in national requirements. Thus efforts to increase coal output are reflected in numerous conversions of winders and haulages to electric drives as well as in the rapidly increasing demands for flameproof motors, many of large capacity. Part of the electrical contribution towards winning the " Battle of the Atlantic " is manifest in the wholesale supply of welding equipments of all types to the shipyards.

Plenty of evidence is afforded of the prevailing activity in the metal industries. The electrification of rolling mills of all sizes and for all purposes and the provision of arc and high-frequency and heat-treatment furnaces are among the responsibilities shouldered by electrical manufacturers.

Electrical Control

While the great bulk of the motors which have been made for general industrial purposes are of the induction type the large numbers of rectifiers and Ward-Leonard sets under construction indicate that for certain purposes the DC motor still has a large field of usefulness. Full advantage has been taken of the scope for ingenuity in devising means of electrical control, *e.g.*, automatic sequence operation of machines and pre-set temperature control of furnaces within very fine limits.

In switchgear, some progress in small-oil-volume circuit-breakers up to 132 kV and in the extension of the 400-V 25-MVA air-break range for industrial purposes may be noted. The latter is now available for the highest currents that ought to be carried at medium voltages. Prominence

in insulation developments is given to plastics (which are also being substituted for metals to an increasing extent), while the use of impregnated woven glass suggests momentous possibilities.

From the foregoing considerations it is clear that electrical manufacturers of this country, profiting by the additional experience gained under the present stress of circumstances, are very well placed for meeting whatever may be the demands of industry in the future.

Useful Information

THE lack of adequate and properly co-ordinated statistics has been the subject of comment in these columns from time to time. In the April before the war, for instance, we referred to the difficulty which the Electrical Development Association found in getting members to provide information. This is an interesting point because in reviving the matter in a letter published in our "Correspondence" pages Mr. H. C. Busbridge (Swinton) suggests that E.D.A. should be the collector and tabulator of statistics useful to the electricity supply industry. We feel inclined to adhere to our original idea that the Electricity Commissioners are probably in a better position to act as a central clearing house for statistics and other information, if only by reason of the fact that they have authority to *require* undertakings to provide information.

Standard Overhead Lines

THE need for economy in rural distribution is reflected in the modification made by the Electricity Commissioners in their requirements for overhead-line construction. Savings over a more extended range would be affected by standardising designs (including that of components) as Messrs. H. Willott Taylor and K. L. May claimed in the paper read before the I.E.E. Transmission Section last week. The E.R.A. designs for pole lines up to 22 kV, of which the authors spoke favourably from operational experience, seems sufficiently flexible to allow of variations to meet local conditions and new developments. The proposal to adapt this design to 33-kV systems and heavier conductors seems feasible and will no doubt be considered by the B.S.I. which now has the question in hand.

Cleated Wiring

THE new B.S. 1096-1943, particulars of which were given in our issue of February 12th, prescribes not good but temporarily necessary practice resulting from the shortage of rubber and lead. Insulation consisting of one coat of 6-in. varnished cambric for 0.0225 sq. in. or smaller cables (two for larger sizes) run on cleats and another coat of varnished adhesive tape covered with wax-impregnated cotton braid can hardly be regarded as meeting adequately the conditions of No. 2 of the Factory Electricity Regulations, even though a label attached to each coil of wire gives warning that it is not fully insulated. It is to be regretted, also, that I.E.E. Regulation 402 is thus in abeyance. This emergency wiring, unless well out of reach, should be replaced as soon as circumstances permit.

Lamp Standards for Scrap

SOME concern is felt at Torquay over an inquiry from the Ministry of Supply on the possible requisitioning of a number of street lamp standards. None will contend that these should be regarded as sacrosanct if the metal is needed for war purposes, but it is naturally felt that equipment which will be required for public safety immediately the war is over and would be difficult to replace at once should be taken only as a last resort. This contingency was foreseen by the Association of Public Lighting Engineers which in a recent message to members urged that protest should be made through the Association if any official request of this nature were made.

Cable Economies

THE saving in lead through the adoption of the jointing methods prescribed in the new official instructions, summarised in this issue, should be quite appreciable. As an illustration, a cable 1¼-in. in diameter would require only 3¾ oz. of metal for a wipe 1 in. long, whereas it would take 9¼ oz. for a 1¾-in. cable. Many 11-kV cables have given long and reliable service with cast-iron joint boxes, which can very well be used provided this does not involve special designs. Although it seldom pays commercially to dig up unwanted cables, that should not be a deterrent in present circumstances, provided the man-hours entailed are reasonably few.

Switchgear Dispersal

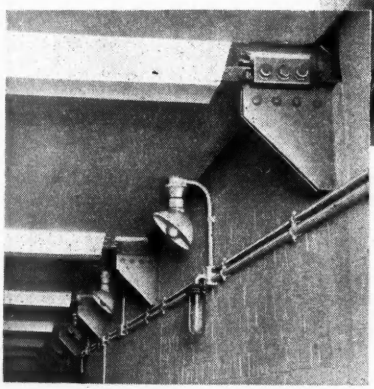
Precautionary Measures at a Modern Primary Distribution Centre

THIS article describes one of the many distribution centres which have been established throughout the country to conform to the recommendations of the Electricity Commissioners, and it supports fully the contention that the sectionalising and dispersal arrangements officially advocated add materially both to the reliability of switchgear and the continuity of supply. The function of the centre is to control in an efficient and normal way, compatible with modern conditions, an incoming bulk supply and outgoing distributors, all operating at 6·6 kV. A major segregation is provided by housing a section of the switchgear in each of a number of widely dispersed switch houses, the equipment in all of which is operated from a common control house.

The switch houses are all practically identical in construction and lay-out, and the essential structural feature of each is that the building proper is "built around" the switchgear. A 14-in. central wall running longitudinally from end to end of the building divides it into two horizontally, while an intermediate concrete floor built into the central wall divides the building into two vertically. Thus there are four rooms, one for each of the main sets of components of the installation—the main isolators and potential and current transformers; the circuit-breakers and their operating mechanisms; and two busbar systems, one room for each. The whole of the distribution equipment is built on to the central wall, on either side, and between the front of the equipment and the outer building wall in each of the rooms there is a maintenance and inspection gangway of ample width.

There is a substantial concrete raft into which the building steelwork is tied, and on this stand the 14-in. windowless outer brick walls which are surmounted by a 6-in. reinforced-concrete roof. But the central wall is not tied to the roof, nor is the intermediate floor tied to the outer walls; indeed, there are a few inches in each case between the top of the central wall and the roof and between each outer wall and the corresponding end of the intermediate floor. Support is given to the outer ends of the intermediate "floating" floor, however, by means of girder brackets built into the outer walls, the floor resting on the brackets fitted with rollers.

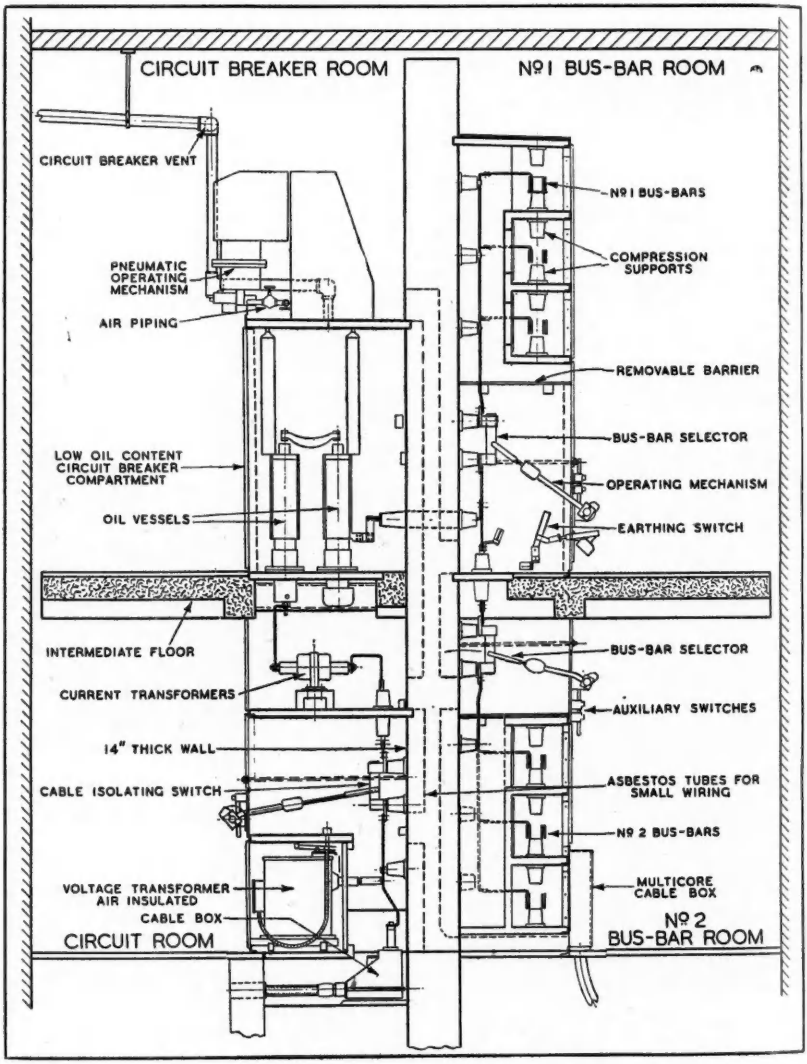
Between the front of equipment and the outer building wall in each room is an ample maintenance gangway. The illustration shows the circuit room



Support is given to the outer ends of the "floating" floor by means of girder brackets built into the outer walls

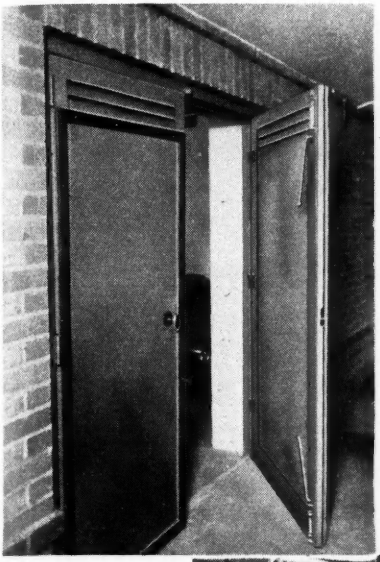
It will thus be seen that any movement of the outer walls and roof due to blast will not be transmitted to the central structure carrying the main equipment. Lips projecting inwardly from the outer walls are intended to prevent flame from passing from one room to another through the space which is provided between the floor and the outer walls.

Further, the central wall and the 6-in.



The whole of the distribution equipment is built on to the central wall to guard against the transmission of vibration from the outer walls. The drawing is a sectional elevation of one switchhouse equipment

reinforced-concrete intermediate floor form effective fire and blast partitions. At each end of each room there is a "blow-out" blast door panelled with waterproofed fabric, and all four doors at either end of



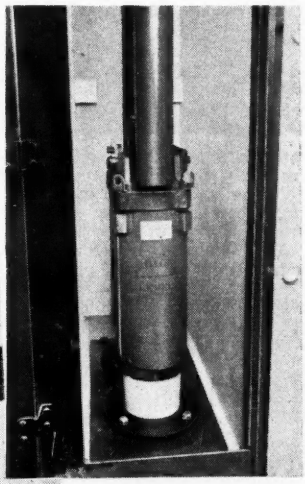
the building open out into an access chamber in which are a staircase and landing serving the upper storey. The outer walls of the access chambers serve as blast protection walls for the entrances.

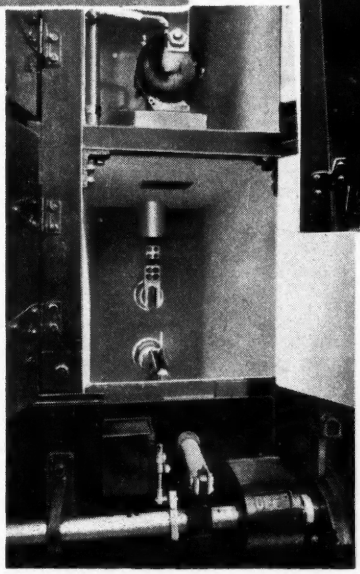
With the above segregation measures in respect of the buildings it is logical to find a lay-out of switchgear in which the maximum dispersal of the components is obtained. This has been achieved by a novel and interesting scheme employing stone cubicle switchgear, and an essential feature of this design is the use of minimum-oil circuit-breakers.

The cells are constructed of 2-in. and 3-in. pre-cast concrete slabs fitted into a skeleton steel framework, the whole being built into and forming part of the central structure of the switchgear buildings, so that a particularly rigid and substantial construction is obtained, offering the maximum resistance to blast conditions.

The circuit room on the ground floor and the circuit-breaker room on the upper storey are on one side of the building, while the two busbar rooms are on the other side. Immediately beneath each incoming or outgoing unit in the circuit room is a small pit into which the 6·6-kV cable enters directly without any pre-run of cable trench, horizontally in line with the cable dividing box, there being just enough room in the pit in front of the dividing box for the jointer efficiently to make the necessary connections and wipe the sleeve joint. Throughout the

Left : At each end of each room there is a "blow-out" blast door panelled with oiled fabric

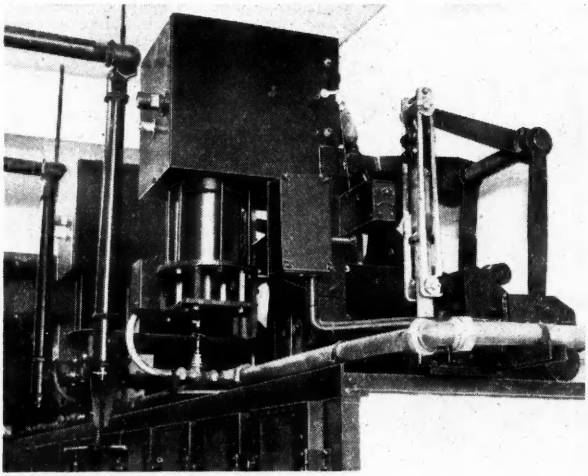




Above : A double-break on each phase necessitates two oil vessels ; note exhaust risers
Left : Maximum dispersal of the components has been achieved by employing stone cubicle switchgear ; isolating switch and current transformers

circuit run the three phases which are, of course, separated, and in tracing the run it will be sufficient to refer to one phase only. From the dividing box there is a riser at the back of the floor-mounted

potential transformer cell to the main cable isolating switch just above the cell, and from this isolating switch the circuit is continued through a horizontal separating slab to a current transformer which is immediately under and connected to the two double-pole circuit-breaking vessels mounted on the intermediate floor.



The pneumatic operating mechanism surmounts the circuit-breaker cubicles, being fed from an air line along the top front of the cubicles

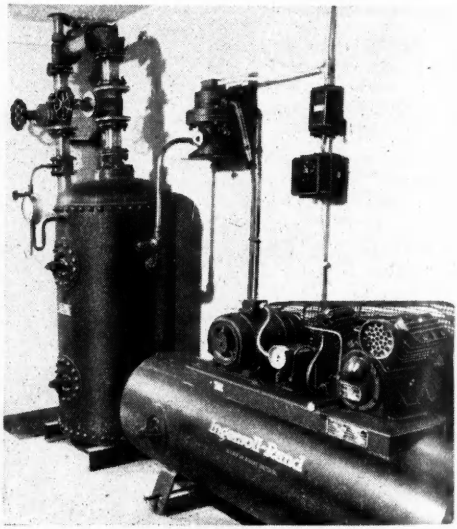
The potential transformer runs into and out of its cell on rails with ramp extensions at the front, suitable plug and socket connections to the riser at the back being provided for these operations. Each of the three isolators of a complete three-phase circuit are link-connected to a horizontal bar along the front of the equipment, and lever operation of this bar actuates the isolators. There are local "on" and "off" semaphore indication and remote electrical indication at the corresponding panels in the control house for these isolators.

Circuit-Breakers

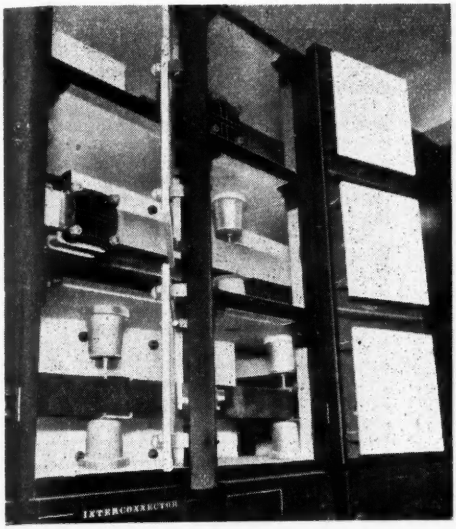
In describing the circuit-breakers as of the low-oil-content type it should be stressed that the minimum-oil feature is an outstanding point in the design of the equipment as a whole for, apart from the small quantity of oil in the circuit-breakers proper, there is no other insulating oil in the gear, as the potential transformers are air insulated and the current transformers are of the single-turn bar primary type, with either porcelain or paper tubes for primary insulation. There is a double-break on each phase and thus two oil vessels containing the actual make and break contacts. Incorporated in the contact equipment are modern arc control features.

The six vessels or pots for a complete switch contain, all told, about 5 gallons of oil only. In the top of each switch pot is a restricted opening and the two openings per phase communicate with a marble-filled pipe riser. The three risers of each switch run into a manifold which exhausts to atmosphere, so that each switch has its own outlet to prevent the passage of oil fumes from one switch to another, an important feature of the segregation principle.

The six cylindrical oil vessels of each circuit-



Normally the complete switchgear line in each switch house is served by its own compressor; between the horizontal and vertical receivers is an air dryer



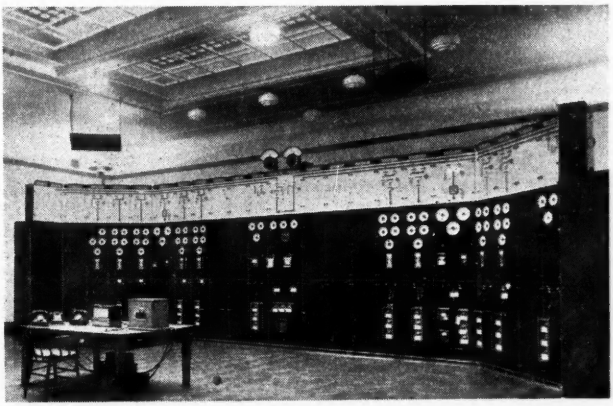
The busbars are carried by modern compression supports; a section of the busbar cells

breaker have external crossheads and contact rods which are raised and lowered vertically by mechanism surmounting the cells in which the oil vessels are housed. The operating mechanism is actuated by compressed air in order to obtain a smoother closing effort and reduce inertia stresses, thus avoiding the time delay associated with flux penetration on large solenoids. The resultant higher closing speed combined with the arc control devices places the circuit-breakers in the high - speed class. The closing time is about 15 cycles and the opening time on fault is about 5 cycles. The circuit-breaker opening is effected by energy stored in accelerating springs, which are compressed while the breaker is being closed.

Incoming breakers and busbar-couplers have carrying capacities of 3,000 A, while the outgoing distributor circuit-breakers can carry 800 A each. The circuit-breakers each have a rupturing capacity of 500,000 kVA. Running along the switchgear line on top of the cells and in front of the operating mechanism is a 2-in. air line from which a tapping is taken to each complete mechanism serving the three phases of each circuit-breaker. The air at each tapping first enters an electrically operated valve chamber from which it is passed to the cylinder of the operating mechanism. From the piston of the cylinder there are link equipments to the three-phase units *via* a pantagraph motion by which the piston motion is imparted to the contact rods running into the oil contact pots.

This electrically operated air valve is, of course, remotely controlled from the corresponding panel in the control house, but each circuit-breaker can also be operated locally by means of a hand lever on the valve. To prevent air pressure from building up sufficiently to operate the circuit-breaker in the event of valve leakage there is incorporated in the main air-valve equipment a small mushroom valve which "bleeds" away any excess air.

By means of a hand cock in the air-line connection each operating unit can be isolated from the air line. The air line in each switch house communicates direct with the receiver of an air compressor unit in the same switch house and normally the complete switchgear line in each house is served by its own compressor. There is, however, an air trunk which interconnects all the switch



The main distribution control board is in crescent formation; note lay lights

houses, so that under emergency conditions the switchgear in any one house can be actuated by the air from the compressor unit of any of the other houses. The air compressor equipment has a 200-lb. per sq. in. compact geared motor-driven compressor which sits on a horizontal receiver, but the air line is actually connected with a vertical receiver between which and the horizontal one is an air dryer. The set starts up and shuts down automatically under the control of a pressure switch when the pressure falls or rises to predetermined levels.

Bus-Bar Rooms

The equipment lay-outs in the two busbar rooms are practically identical, except that the order of the components is reversed, in that, while in the lower room the busbars proper are at the bottom and the busbar selector switch is at the top, in the upper room the busbars are at the top and the selector switch is underneath them. Other exceptions are that in the top room only the safety earthing switch for each switch line is at the bottom of the room, *i.e.*, between the two busbar selector switches, and that the main connection from the circuit-breaker in the circuit-breaker room on the other side of the central wall to the busbar interconnecting line is also in the top busbar room and between the two busbar selector switches.

Maximum safety to the operator is ensured by fully interlocking the mechanically operated busbar selector and cable isolating switches with the oil circuit-breakers and by the provision of an independent earthing switch which allows the circuit-breaker to be earthed before maintenance work is commenced. The busbars are carried by modern compression supports, with a cradle mount which prevents stresses on the porcelains as the result of thermal expansion or contraction of the bars. All the copper interconnections have intermediate supports appropriate to the electro-magnetic stresses associated with 500 MVA at 6·6 kV. To obtain the maximum flexibility of distribution on the complete system one set of busbars in each switch house is linked up permanently with the corresponding sets in the other switch houses by means of interconnectors, while the other set of busbars in each switch house is left isolated as a single section, apart from the busbar coupling circuit-breakers.

Control Wiring

The multi-core control wiring is carried in asbestos tubes built into the central wall, with only a minimum of exposed wiring in the cells, and the wiring of each circuit terminates in a dividing box mounted in a special cubicle at the bottom of every equipment. Cables from these points are run in separate earthenware ducts to the control room where they rise out of the floor into the appropriate control cubicles, without lead-in trenches and with only about 18 in. of pilot cable exposed between the floor and the dividing box.

The main distribution control board associated only with the switch houses is in crescent formation and comprises the requisite number of sheet-steel cabinets, each with two narrow back doors which automatically operate a door switch to put a lamp inside the cell in circuit when the doors are opened.

A smaller control board of similar construction serves for the main incoming supplies to the control centre and is fitted with automatic voltage regulation equipment, while in line with this board is another one for metering the incoming supplies. The general construction of the control house is 14-in. windowless brick walls with a ferro-concrete roof in which are inserted lay-lights with double-toughened glass blocks. An attractive feature is the Rhodesian teak-block floor. At one corner of the control house is a small intake room in which is housed the switchgear for the auxiliary AC and DC supplies for lighting, heating, tripping, etc., throughout the centre.

Normal lighting in the switch houses is by means of angle fittings mounted high up on the outer wall in the equipment rooms and projecting on to the switchgear, and there are well-glass fittings which are automatically switched on from a DC supply in the event of AC supply failure. All the buildings are equipped with thermostatically-controlled tubular heating and there is supplementary panel heating, in the central house.

All the main equipment in the switch houses and the crescent board in the control house are of B.T.H. manufacture, while the two small boards in the control house were produced by the G.E.C.

Crane Driver's Death

AT Halesowen recently an inquest was held into the death of Joseph E. Byng, a crane driver, who was fatally injured at a local works on February 3rd. It was stated by a witness that Byng, who was operating a travelling crane, told him that he was "stuck." The witness went up to the crane and switched off the current from the motor but not from the rods and carried out some repairs. He then noticed that Byng was lying on the top of the crane cabin. He called to him but there was no reply and upon going to him witness found that he was dead. Replying to questions, he said that Byng had no business to be on the top of the crane or to assist in repairs.

A doctor said that upon arriving at the works he found that although artificial respiration had been tried Byng was dead due to shock. He found burns across Byng's left hand and the right side of his neck. Byng was thin and frail and consequently very susceptible to shock.

The coroner recorded a verdict of "Death by misadventure."

Fibrous-Glass Insulation

Properties and Applications

By A. M. Robertson,
B.Sc., A.M.I.E.E.

THE production of glass in fibrous form for electrical insulation is of comparatively recent date in this country, though the material is already firmly established as a high-quality component of various types of insulation.

The chief claim to attention of fibrous glass is probably that it offers a Class B insulation with a space factor comparable with that of the commonly used Class A materials. Moreover, woven asbestos is the only comparable Class B insulation and on that account fibrous glass is attractive for specialised applications on the further points of electrical and mechanical excellence. Electrically, the chief demand is for "continuous" glass fibre yarn, tape and sheet, wherein the fibres are of virtually infinite length in contrast to the 6 to 15-in. fibre lengths in "staple" types of yarn. In wire covering, continuous yarn is preferred on account of its fineness and smoothness.

All weights of continuous yarn are produced from the same basic thread consisting of 102 filaments each approximately 0·0002 in. in diameter. This thread is produced to a standard of 90,000 yd. per lb. which gives a count (similar to "cuts" in asbestos) of "900." This basic yarn carries no twist, but twist is added either to single yarns or to a multiplicity of single yarns after the spinning process.

One basic yarn, twisted, is identified as 1/900 yarn ; two basic yarns twisted together are 2/900, etc. In general, this twisted yarn is rather "lively" for weaving unless it is made with a very low twist and is plied up or doubled, whereby a heavier and more manageable yarn results. The twists inserted during twisting and doubling are in opposite directions and the final yarn is thoroughly balanced up. If two strands of 2/900 are doubled together, the final yarn becomes known as 2/2/900 and so on for other combinations.

An approximate comparison between glass-yarn counts and other systems is as follows:—

Glass Fibre	Nominal yd. per lb.	Silk Denier	Cotton (840 yd. hand)	Linen (300 yd. hank)
1/900	90,000	50	106	298
2/1/900	45,000	100	53	149
4/1/900	22,500	200	27	74
2/2/900	22,500	200	27	74
3/3/900	10,000	450	12	33
4/3/900	7,500	600	9	25
5/5/900	3,600	1,250	4	12

In the finished condition, after twisting and doubling, the yarn may be used either for wire covering or for weaving. Alternatively, it may be further plied up to produce cords for tying purposes in electrical plant.

For electrical uses what is known by the industry as "alkali-free glass" is necessary, *i.e.*, one which is free from any alkali metal oxides such as soda and potash ; this results in a glass possessing good dielectric strength, high insulation resistance and good weathering properties.

Either soda or potash is undesirable in an electrical glass as, under humid conditions, free soda (or potash) leaches out and forms on the fibre surface ; it then absorbs more moisture and sodium hydroxide is formed. This in turn attacks the silicates in the glass. More soda is liberated and the process continues, breaking down the glass and lowering its electrical resistance. This attack may assume serious proportions in an alkaline glass in fibre form where the exposed surface is enormous in comparison to the weight of glass involved. Any glass in which an appreciable Na_2O or K_2O content is found would be suspect electrically.

The method of producing electrical yarns necessitates the use of a textile size. Generally this small amount of sizing in the yarn is of no significance to users of fibrous glass, but in special applications its removal may be essential. This may be easily effected by the use of trichlorethylene either in a washing or reflux distillation process.

Wire Covering

Wire coverers have developed fibrous-glass-insulated conductors of a high standard of excellence. Generally, circular copper is obtainable in diameters of from 0·01 in. to 0·16 in., whilst strip is becoming available in a constantly increasing range of sizes. Two grades of covering are customary, "fine" and "standard." In the heavier conductors the fine covering gives an increase of 4 to 6 mils in diameter and in the lighter gauges 3 to 5 mils, whereas for standard covering the increases are 10 to 12 mils and 6 to 8 mils.

In view of the fact that practically all glass-fibre-insulated wire is varnish-treated during covering, the final product has high moisture and abrasion resistance, high dielectric strength and high space factor as well. For the foregoing purposes the yarn is supplied either "single-end" on cone or "multiple-end" wound on cheese with

anything from 1 to 12 " ends up " as requisite. A good range of fabrics is available in sheet and tape form in thicknesses ranging from 2 to 11 mils. The smaller thicknesses should in due course occupy a place of some importance in the replacement of 3 to 4 Momme Jap silk and similar fine insulating fabrics which are now in short supply.

Varnished-glass fabric is already well established and may be used in the same manner as cotton or silk base fabrics. Synthetic-resin varnished glass-fabric boards are moderately good electrically at power frequencies but show extremely high mechanical properties, thereby providing a ready reply to many slot-wedge problems, particularly in high-temperature machines. Glass-base boards appear to show a much improved power factor at radio frequencies, but data on this aspect is as yet incomplete. For end connections in electrical plant, a useful range of sleevings and tying cords is available.

Use in Accumulators

Fibrous glass, in a form much coarser than textile fibre, plays its part in the construction of accumulators. The life of heavy-duty secondary cells has been increased by the use of separators, or more correctly retainer mats, made from tangled layers of coarse glass fibres. The action is purely mechanical, the mat acting as a trap to hold the paste in place on the cell plates and preventing loose particles from dropping to the bottom of the cell where they could eventually short-circuit the plates. The open construction of the plate allows free circulation of the electrolyte.

The explanation of the apparently conflicting claims that fibrous glass is an excellent thermal insulator and that, in electrical plant, it is a better heat conductor than cotton or silk lies in the relative densities of the glass fibre ; as a thermal insulator for steam-pipe lagging it is packed at an apparent density of the order of 8 lb. per cu. ft. in comparison with 60 to 70 lb. for a woven fabric used for electrical purposes.

Unimpregnated Fabric

Whilst the makers of fibrous-glass textiles have never claimed that untreated textiles were a complete insulation until they had received further treatment with varnish or other compound, numerous instances have occurred where for specialised requirements impregnation of the glass fabric has been omitted with most satisfactory results. Doubtless these results are due in no small measure to the exercise of particular care in applying the fibrous glass by a carefully thought out technique. It is a relatively new material and requires a different method of handling from that employed with cotton or silk, but when attention is paid to the modifications it is quite as readily applied as the more common fabrics.

Extensibility of glass yarn is about 1 or 2 per cent. compared with 20 per cent. for viscose and 5 per cent. for cotton. This lack of elasticity necessitates more accurate machine adjustment, particularly in wire covering. Guides must be smooth, tensioning devices sensitive, and any paying-off devices should run free from jerks. In taping, as in wire covering, chafing and cutting on sharp edges must be watched for. Greater tension may be used in applying glass textiles due to their high tensile strength thereby making for neat finish.

Forthcoming Events

Institution of Electrical Engineers.—Monday, February 22nd, 5.30 p.m. Informal discussion on " Single- to Three-phase Conversion with special reference to the Ferraris-Arno System," to be opened by Mr. A. H. Maggs.

Transmission Section.—Wednesday, March 10th. 12.30 for 1 p.m. Connaught Rooms, London, W.C.2. Informal luncheon (tickets 8s. 6d. each). At 5.30 p.m. a Section meeting will be held when Messrs. F. Favell and E. W. Connon will present their paper on " The Ventilation of Substations."

North-Western Centre.—Saturday, February 20th, 2.30 p.m., Engineers' Club, Manchester. Paper: " Fluorescent Lamps," by Messrs. L. J. Davies, H. R. Ruff and W. J. Scott. (Joint meeting with the Institution of Post Office Electrical Engineers).

North-Eastern Centre.—Monday, February 22nd, 6.15 p.m. Neville Hall, Newcastle-upon-Tyne. Paper: " A Critical Survey of the Whole Field of Bus-bar Protection," by Messrs. W. Szwander and M. Kaufmann.—*Students' Section.*—See N.E. Coast Institution.

West Wales (Swansea) Sub-Centre.—Saturday, February 20th. Paper: " Automatic Boiler Control with special reference to Recent Developments and Future Progress."

North Midland Students' Section.—Saturday, February 20th, 2.30 p.m. Griffin Hotel, Leeds. Paper: " Dialling over Long Distance Telephone Circuits," by Mr. B. R. Horsfield.

Devon and Cornwall Sub-Centre.—Thursday, February 25th. Exeter. Paper: " A Differential Electronic Stabiliser for Alternating Voltages and Some Applications," by Mr. A. Glynne.

North-East Coast Institution of Engineers and Shipbuilders.—*Students' Section.*—Wednesday February 24th, 2.30 p.m. Neville Hall, Newcastle-upon-Tyne. Address by Prof. C. J. Hawkes, past-president. (Joint meeting with North-Eastern Students' Section of the Institution of Electrical Engineers.)

Electrical Association for Women.—*London Branch.*—Tuesday, February 23rd, 12 noon. 20, Regent Street, London, S.W.1. Annual meeting.

Cooker Hotplates

Co-operative Research to Secure All-round Improvement

By J. Allen
(Showroom Sales Superintendent, Bury Corporation Electricity Department)

AMONG the matters which the electrical industry should consider in connection with post-war planning is the design of electric cooker hotplates, a subject which has been discussed for many years.

Although new ideas have been introduced from time to time, no really revolutionary plate has been developed during the last ten years and one cannot help but wonder what the position will be when the war ends. Is it possible that supply authorities will be content to carry on in the pre-war manner, trying this, that, and the other, a new plate by this firm, another new one by that firm, all more or less constructed on similar lines with various minor alterations? If some sort of plan to deal with this important problem is not prepared, the same difficulties will have to be faced after the war.

It must be admitted that no pre-war cooker hotplate could be considered really satisfactory. One reason for retarded progress has been the problem of cost. Manufacturers, competing for business, were forced to "cut" in every way if they wished to be "in the hunt." If there is one thing the war has taught us it is that money means very little. It is not the cost of a thing that matters so much as the value which is obtained and whether the article will do its job efficiently and without trouble.

Essential Features

From the supply authorities' point of view, which incidentally, in this case, is identical with that of the general public, the ideal hotplate should possess three attributes:—(1) Quick boiling time (faster than gas); (2) full-range variable heat control; and (3) a guaranteed life of at least five years.

These three features, it may be pointed out, have been the aim of hotplate manufacturers from the beginning. Assuming this to be so, can the reason for lack of development be the fact that the makers' efforts have not been directed along the right lines? For instance, have the efforts of the manufacturers been sufficiently co-ordinated and organised? Have they been in a position to afford the necessary expenditure to continue their search as they would have wished? In some cases it is even possible that there are manufacturers who have never fully realised the importance of the hotplate to the electricity supply industry.

The production of a plate with the features enumerated above would, naturally, be the result of much research, but not research as it has been conducted in the past by individual manufacturers in all parts of the country each working along different lines. A central body should be formed by the cooker manufacturers to conduct research entirely on the subject of hotplate production. This body would consist of the leading "brains" of the country on hotplate production, together with other technical and scientific men.

This research department would have its own specially constructed laboratory and its work would be to supply specifications of the plate recommended by them. This plate would obviously be the best the country could produce and would become standard for all cookers.

Too Many Types

It is totally unnecessary to have many types of hotplates; one type of hotplate made in two or, at the most, three sizes is quite sufficient for any requirements. At the outbreak of war there were solid plates with various loadings and numerous ways of connection fixed to cradles of all sizes and shapes.

There were open type plates, radiant plates, transformer plates, multi-heat control plates, plates with special simmering devices and others without. Recently someone has suggested a beaded element plate. As to shape, some were oval, some round, some square, and some oblong. It might be argued that they were constructed for different requirements, but the purpose of a hotplate is the same the country over; its job is to boil quickly, to be capable of simmering if required and to have a good life free from trouble; we also want to get rid of the bugbear of special utensils.

A scheme of this kind would naturally involve a certain amount of expense and during the first year or so owing to the cost of laboratories, instruments, etc., it would be considerable. That, however, would not matter in the least so long as the results are worth it. The money would, nevertheless, have to be raised and there are at least three possible sources which instantly come to mind.

In the first place, the consumer would naturally have to "stand" a certain proportion of the cost of research in the price of the apparatus. This is entirely justifiable, for he would obtain an article which would give much better service and he would have less trouble and annoyance, thanks to the longer life of the plate.

The second source from which money would be obtained is the manufacturers

themselves. Before the war, manufacturers spent a certain amount each year on research and experiment in connection with hotplates. This money could be passed to the Research Committee and the manufacturers need make no increase in expenditure. They could, moreover, afford to augment their payments because of the increase in the sale of cookers which would result.

The third source of monetary assistance would be the supply undertakings. Here again, a yearly subscription would be a paying proposition. The production of a plate with a guaranteed longer life would greatly lower maintenance costs and in many cases would mean a reduction in maintenance staffs. There would also be a further gain from cookers sold outright.

Only the bare fundamentals of the scheme have been outlined; much could be written in further support of it. It is to be hoped, however, that cooker manufacturers will carefully investigate its possibilities with a view to adopting it.

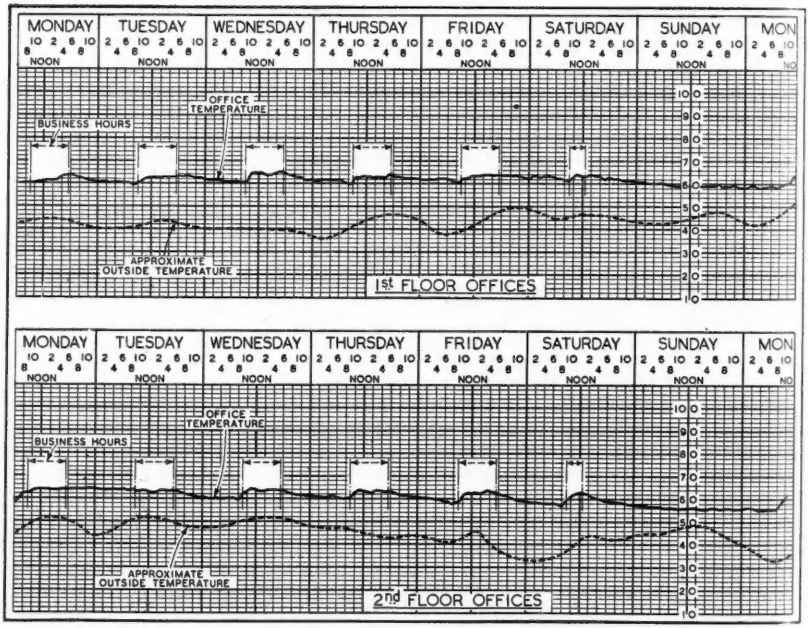
Heating Buildings

Improved Performance of a Thermal-Storage Installation

By F. Mather, A.M.I.E.E.

FOR some time I have been trying to get the most economical results from a 750-kW electrode circulator and thermal-storage system used for heating offices and workshops and was therefore greatly interested in the table on p. 681 of the *Electrical Review* of November 27th. The temperature drop between flow and return is assumed to be constant over a wide range of outside temperatures whereas, in the installation I have referred to, the drop varies from 5 deg. F. in mild conditions to 15 deg. under adverse conditions, which incidentally obtain on boisterous days rather than on cold still days.

The thermograph chart included in the previous article (p. 682) appears to indicate



Thermograph charts for first and second floor offices, the former being for the week beginning November 2nd, 1942, and the latter for the following week

that there is room for improvement in the installation concerned, since there is considerable variation in office temperature during the working day and the fact that the temperature is maintained at 69 deg. throughout the night must result in appreciable wastage of heat between 5.30 p.m. and 9.0 a.m.

The thermograph charts reproduced herewith, giving the results obtained from the installation with which I am concerned, show that whilst the temperature in the offices is reasonably uniform during the working day, it is much lower during the night, thus helping towards economical working by keeping the wastage of heat to a minimum.

Heat is not applied to the office installation in the morning until one hour before the staff arrives and it is turned off one hour before the offices close in the afternoon without causing any discomfort. Although the source of heat is turned off, the hot water still continues to circulate in the system until it cools off since the circulating pump is left running. The pre-heating period for the offices commences an hour after that of the workshops. This again results in a small economy.

Biased Thermostats

Certain other measures have been tried with a view to improving the performance of the installation and effecting economies, however small, where possible. One of these measures is to bias the control thermostats (of which there is one placed centrally on each floor of the office installation) so as to operate at a lower temperature on " rising temperature " than on " falling temperature." Each thermostat controls a motorised valve in the return water pipe and every time a valve opened the temperature rose in the offices concerned and used to " overshoot " appreciably. The biasing of the thermostats was easily arranged and has obviated overshooting to a large extent, thus giving a much more even temperature in the offices. Furthermore, since the offices are not all of similar structural design (some having a large area of glass and slate) they cooled down at different rates during the closed periods of the motorised valves and this led to wide variations in temperature with consequent discomfort in some offices. The biasing of the control thermostats has led to more frequent operation of the valves, thus reducing these cooling-off periods and smoothing out the temperature variations appreciably.

A further measure which has been tried is to obtain some variation of water-flow temperature to correspond with changes in the humidity of the outside air since the installation is in a notoriously humid area. The reason for this attempt is that from about 45 deg. F. upwards increasing humidity gives an impression of increasing temperature even though the actual air temperature may remain constant. The flow temperature is controlled by differential bulbs, one exposed to flow temperature and the other to outside air temperature, and the method was to convert the latter from a " dry " bulb to a " wet " bulb. This means that an increase in humidity should cause a reduction in water flow temperature and consequently a reduction of inside temperature. Whether the result will be noticeable remains to be seen, but the alteration was quite simple and will be justified if there is the slightest improvement.

Further efforts were made to improve the performance of the installation by automatically varying the load of the electrode circulator to correspond with changes in outside temperature. Prior to this, the load was controlled by a relay which kept the current constant unless altered by manual control and had therefore to be set high enough for the most severe conditions.

Reducing Maximum Demands

Automatic control was obtained by means of a number of thermostats exposed to outside temperature, each arranged to close circuit at a different temperature by progressively shunting the relay operating coil. The result is that the maximum demand is kept as low as possible and the re-charging of the thermal storage tank can take place for the longest possible period during the night. This is more economical than using a high load which will bring the storage up to full temperature early in the evening and leave it to lose heat all night, since, even though the storage tank is well lagged the heat loss is of the order of 14 kW at maximum temperature (240 deg. F.). Furthermore, the copper loss in the transformer supplying the installation varies as the square of the load so that the replenishment of the stored heat is more economically carried out at a low load during the maximum available hours. There are also certain other advantages of a practical nature.

No doubt further improvements will be made as time goes on, but the results now being obtained show that an automatic electrically-heated system with thermal storage can give excellent results, needs little attention and is clean and economical, if really well designed and intelligently operated. It seems particularly important to give close consideration to the thermal-storage capacity in relation to the heat requirements of the premises and the stipulations of the tariff.

It is estimated that the reduction of heat during nights and week-ends, together with the measures mentioned in these notes, effects an economy of some 16,000 kWh per month or about 17·5 per cent. of the average consumption. These details are given by permission of Mr. J. Harwood Lumsden, chief engineer to the Stalybridge, Hyde, Mossley and Dukinfield Transport and Electricity Board.

New I.M.E.A. Centre

South-West England and South Wales Area

THE inaugural meeting of the newly formed South-West England and South Wales Centre of the I.M.E.A., was held in Bristol on January 28th and there was a large attendance, which included Mr. F. Newey, president of the Association, who gave an address in which he mentioned the special services rendered in the formation of the Centre by Mr. B. Handley (Portsmouth), Mr. A. J. Newman (Bristol) and Mr. A. Nichols Moore (Newport). Mr. Newman was unable to be present as he was in London on business. At the first meeting of the Executive Committee, held after the inaugural meeting, Mr. A. Nichols Moore was elected chairman of the Centre, Ald. A. A. Senington (chairman of the Bristol Electricity Committee), vice-chairman, and Mr. E. Jones (city electrical engineer, Cardiff), hon. secretary and treasurer.

Members who attended the inaugural meeting on January 28th, of the South-West England and South Wales Centre of the Incorporated Municipal Electrical Association.

Left to right: Messrs. J. T. H. Legge (Central Electricity Board); J. W. Spark (chief electrical engineer, Bath); J. W. Simpson (Secretary, I.M.E.A.); W. J. Bache (Cheltenham); B. Handley (engineer & manager, Portsmouth); Ald. W. J. Lewis (Portsmouth); F. Newey (President, I.M.E.A.); Ald. A. A. Senington (Bristol); H. Midgley (city electrical engineer, Plymouth); Ald. A. E. Gough (Cardiff); A. Nichols Moore (borough electrical engineer, Newport, and chairman of the new Centre); E. Jones (city electrical engineer, Cardiff); C. Garfield Richards (engineer & manager, Port Talbot); Coun. J. Treharne (Mayor of Port Talbot); Coun. Jenkin John (Penybont R.D.C.); T. Wilkins (electrical engineer, Penybont); Coun. T. E. Jones (Bridgend U.D.C.); H. Jackson (chief engineer & manager, Cardiff R.D.C.); L. W. Williams (electrical engineer, Ogmore & Garw U.D.C.); F. Welbury (electrical engineer, Bridgend U.D.C.).

Employment of Women

Statutory Restrictions Relaxed

EXISTING legislation governing the employment of women has made it difficult to make full use of their services in the electricity supply industry, particularly as regards shift-work and week-end maintenance work. The matter was taken up with the Ministry of Labour and National Service by the National Service Committee operated jointly by the National Joint Board and the National Joint Council for the Electricity Supply Industry and as a result the Minister has made an Order enabling the restrictions to be relaxed.

This Order—the Electricity Supply (Hours, Safety and Welfare) Order, 1943 (S.R. & O. 1943 No. 187, Stationery Office 1d.)—applies standard conditions to the whole of the industry and these are exercisable with the permission of the District Inspector under the Factory Acts. When this permission is obtained women may be employed in accordance with one of the schemes scheduled to the Order and different schemes may be applied to different sets of workers.

The schedule sets out in detail: (a) A three or four shift system; (b) A two day-shift system; (c) A two (day and night) shift system; and (d) A scheme for extended day work. The National Service Committee was satisfied that these schemes would meet all the requirements of the industry.

It is not necessary for the half-hour break after 4½ hours' work to be uniform. It may vary for different sets of workers. A woman welfare supervisor is required when women are employed on night shift, but the Minister has indicated that if two women are on night shift the requirement will be met by appointing one of them to be the supervisor.

In an exceptional emergency women may be employed on a seventh day in the week by express authorisation of the District Inspector. Women may be required to work an extra two hours in case a relief worker does not report for duty. No consent of the District Inspector is required in this case. Notwithstanding the provisions of Section 20 of the Factories Act, 1937, women may be employed on the cleaning of part of a prime mover in motion, if such cleaning does not expose them to risk of injury.

Electricity Economy

Informal Discussion at the I.E.E.

AN informal discussion on the use of electricity in relation to fuel economy took place at the meeting of the Installations Section of the Institution of Electrical Engineers on February 11th. It was opened by Major H. R. Rawll, whose previously circulated contribution was dealt with in our last issue.

Mr. J. N. Waite (Central Electricity Board) said the Board was not only interested in saving fuel by the cutting down of consumption, but also in the effect that it had in reducing the maximum demand at any time of the day. A reduction in consumption as such did not necessarily mean a reduction of the maximum demand. There had been a considerable reduction in consumption as a result of the fuel economy campaign, but reduction of consumption did not bring with it a corresponding decrease in costs of production. He did not, however, think it would be to the detriment of the supply industry in the long run; the campaign was showing consumers how to get the best out of their plant and apparatus which would help to make electricity more popular than ever.

Transfer of Load

The national morning peak load was very considerably higher than the afternoon peak, and if, say, about half of that excess could be transferred to the afternoon, it would be of the greatest possible assistance in freeing that amount of plant for dealing with future increased loads. It should be possible to transfer to the afternoon such loads as refrigerating plant, engine testing plant, some heat treatment processes and furnace and thermal storage loads. Although economies in heating and cooking and lighting were small, they should not be despised. The lighting load was now nearly double what it was in peacetime as darkness came on.

Mr. J. I. Bernard (E.D.A.) said that considerable economies had been made in industry without any serious effect upon war production. In factories space heating had been adopted in many cases because of difficulties in extending piping of hot water systems. Sometimes those electric heaters had been put in without thermostatic control and they had also been used in very lightly constructed buildings which lost heat very rapidly, a type of building extravagant to heat by any means. The overall efficiency of electric space heating could be quite comparable with anything done with hot water or steam. His information showed that operators did not switch off individual motors as often as they should; frequently when modern individual drive was applied to a series of machines, the old line shaft, driving fewer machines, was still being driven by the original motor.

Mr. Oliver Lyle (Tate & Lyle) said that by careful control and supervision the load in his works had been reduced from 3,500 kW two years ago to 2,700 kW.

Mr. Douglas (J. Lyons & Co.) said his firm had tackled the problem of fuel economy in the autumn of 1939. At the end of the first nine months the saving in their hotels, restaurants and teashops amounted to 21 per cent. in electricity used and it now was 31 per cent.

Mr. H. W. Brighten said he had visited a large number of industrial boiler plants for the Ministry of Fuel and Power and had found the economy fairly good but it often happened that the instruments had been allowed to fall into disuse or that readings were taken and no further use was made of them. On the other hand, he could not say that the efficiency shown on the utilisation side was anything like as high as it was in the boiler house.

Mr. H. Bullas said that there were many small industries in which the load could be staggered to assist in removing the morning peak, and in this connection he mentioned laundries.

Use of Stand-by Plants

Mr. C. King suggested the use of stand-by plants—which he said had increased considerably since the war—to assist the public supply system during the peak load. He also advocated more efficient boiler control methods in industrial plants and greater control of temperatures in large buildings where there was a great tendency to overheat. He suggested that during the war, preference should be given to the use of solid fuel for new heating installations; electricity was far too valuable for war purposes to be used for space heating.

Mr. C. T. Melling objected to the use of the term " space heating," remarking that we did not heat space but the human body, and for that purpose electricity was far more economical than other methods. On the question of the economies to be obtained domestically, he pointed out that the Ministry of Fuel and Power had now changed its attitude towards this matter and was concentrating more on the economies to be achieved in heating rather than lighting.

Mr. A. Morgan thought that the standards of lighting and heating required by regulations should be reduced. He also advocated easier

control of motors by operators of machines.

Major Rawll wound up the discussion by saying that much of what had been said related to a long-term policy, but it was essential to get quick results now. The secret of it all was to approach executives, operatives and consumers in the right manner. As to the use of stand-by plants, mentioned by Mr. King, the authorities had this matter under consideration.

Standard Overhead Lines

General Approval of Proposals

THE building of single-circuit overhead power lines for up to 33 kV to standardised designs throughout this country is urged by Messrs. H. Willott Taylor and K. L. May (Edmundson's Electricity Corporation, Ltd.) in a paper prepared for the Transmission Section of the Institution of Electrical Engineers. The authors believe that their object can be achieved in a rational manner that will avoid any likelihood of stultification of new ideas, after preparation in the usual way by a standing B.S.I. Committee.

In reviewing some of the Electricity Commissioners' Regulations, particular reference is made to their latest modifications in respect of light lines. Details are included of a design for light lines up to 22 kV with conductors of 0·04 sq. in. or less which has been evolved by E.R.A., these lines being cheaper than existing types owing to simplicity and ease of erection.

Adaptable for 33 kV

The general adoption of this design as a standard is recommended by the authors, who maintain that with slight modifications it should be adaptable for 33 kV as well as for heavier conductors. Alternative employment of wooden H-poles and suspension insulators is suggested for special cases, while details are given of a proposed design for low-voltage lines. Standardised components should be prepared so as to be obtainable from any of the usual suppliers.

There does not appear to the authors to be any reason why such designs should not now be introduced. Once the effort has been made, causing the resultant benefits to become more clearly evident, the natural reluctance of distributors to relinquish such of their own designs as have been satisfactory in service is not likely to be a serious stumbling block. Test lines erected in the areas of some of the Edmundson companies have operated satisfactorily in confirmation of the soundness of the recommended design.

Finally, the authors advocate joint meetings as soon as practicable to endeavour to modify standard conditions for railway crossings and to ease the present somewhat onerous conditions imposed by the Post Office authorities. They further suggest that greater use should be made of " joint user " poles, to the advantage of both parties, without prejudicing the safety of P.O. lines.

Discussion

Mr. S. R. Siviour (Yorkshire Electric Power Co.), opening the discussion, said that the proposed standardisation of a complete overhead line through the medium of a British Standard Specification was a departure for B.S.S. were intended to ensure a generally accepted quality of performance of apparatus and plant and also to protect the manufacturer against unfair competition.

He contended that flexibility could be provided without such major alteration of the standard design of overhead lines as the authors had put forward. The design prepared by E.R.A. was somewhat rigid, but perhaps that would be remedied. Then, if the war went on for another year, would there be a sufficient supply of home grown timber? The paramount consideration to-day was economy of materials and labour and standardisation of the principal components should achieve this and pave the way for post-war development.

To guard against inconvenience, especially for the larger undertakings which had their own systems of co-ordination, he suggested that any proposed specification should permit of modifications to suit local conditions. There should be no haste in formulating an official standard design, which should be developed only after full consideration by all interested parties.

Insulator Makers Praised

Mr. C. W. Marshall (Central Electricity Board), thought the authors had gone a long way towards establishing their case for standardised overhead lines within the range of voltage considered in the paper, but he thought the case could have been made stronger if it had been crystallised quantitatively. He paid a tribute to the insulator manufacturers who had taken a rather heterogeneous series of insulators of the cap and pin type and worked out means whereby they could be rendered interchangeable with the minimum of dislocation.

Mr. R. C. Anderson (Electric Transmission, Ltd.), considered that unless care

were taken overhead lines would be considered not as an end in themselves, or an end to obtain cheap electricity, but as an end to get standardisation. He felt that the ideas put forward should be rejected in favour of a sound rationalisation of transmission line concepts. Cheap construction did not necessarily mean a cheap supply of electricity; indeed, it might result in an inefficient service.

Limit of Relaxation Reached

Mr. H. C. Waters (East Anglian Electric Supply Co.), contemplating the necessity for large capital expenditure by supply authorities after the war, said it was imperative to look into the question of standardisation very carefully now. The need would be to reduce the costs of overhead lines because supply would have to be carried to so many sparsely populated districts. It seemed that the Commissioners had gone as far as they dared in the relaxation of their Regulations, and therefore there was no alternative to standardisation if cheaper construction was to be achieved.

In his undertaking they had been working lines to a little higher stress than that recommended by the authors and had experienced no trouble. For five or six years, also, they had erected many lines with an unearthed network with improved results.

Mr. W. Fennell (Mid-Cheshire Co.), did not think the stage had been reached when it was wise to standardise important features of overhead equipment, because only about six months ago the Commissioners had issued their latest relaxation.

The whole secret of reduced costs was to see what could be left out in the way of equipment, not what could be put in, and this might be an important factor in standardisation. He hoped that no attempt would be made to seek overhead line design development by way of compulsion.

Wider Adoption of British Standards

Mr. N. E. P. Harris (Bullers, Ltd.), remarked that although the authors said they were proposing standards only for Great Britain, it would be a great advantage to other countries also to adopt British standards. The object in this country hitherto had been not to impose restrictions but to lay down what it was agreed was necessary and then leave designers to make the best job they could. As regarded insulator spindles, he imagined that most power companies would not like the suggestion made in the new draft specification that lead heads should be eliminated because they had already been standardised.

Dr. H. G. Taylor (Copper Development Association), said that standardisation was necessary because design varied so enormously all over the world. In suggesting 0·025 and 0·04 sq. in. copper conductors he believed the authors had chosen the right sizes.

Mr. H. W. Grimmitt (Electricity Commission) expressed the view that if standardisation was to be carried out there must not be too much flexibility; the limits of usefulness must be very carefully defined. After the war it would be necessary to cut out extravagant and wasteful design and standardisation of the minimum type of construction would be imperative.

He agreed that the Commissioners' Regulations required bringing up to date, and it would be extremely useful if the regulations for mines, quarries and factories and the conditions for crossing Post Office wires and railway lines were brought together. He emphasised, however, that the Commissioners' Regulations were the smallest publication in any country and they had always kept clear of anything in the form of specification.

Mr. J. L. Eve (Eve Construction Co.), thoroughly agreed that standardisation should be carried out, speaking from the contractors' point of view. His only criticism of the paper was that it was ten years too late.

Tested in Practice

Mr. W. Burton (S.W. & S. Electric Power Co.), said his company had had some 30 miles of horizontal lines, according to the proposed standards, in operation for three or four years, and there had been very gratifying results. Another 20 miles was now being erected. The Wessex Co. had 20 miles of similar lines and it had had no troubles.

Mr. R. Borlase Matthews said that insufficient attention had been paid to the ferro-concrete pole, which he believed would come into a great deal more use in this country in the future. The paper made no reference to insulator supports of the clamp type. The use of pressings instead of angle iron would enable the strength to be placed where it was wanted. Circular pole caps would also be an advantage.

Mr. V. B. Twiss (W. T. Henley's Telegraph Works Co., Ltd.), was not convinced that the flat form of cross arm for intermediate poles was the ideal design. Before standardisation of design generally could be efficiently achieved, he thought that it would be necessary to standardise the regulations on which design was based.

Mr. W. R. N. Moody (County of London Electric Supply Co.), said that he wished he could share the authors' view that a standard line would be or could be adopted without some measure of compulsion. Mr. G. B. Burdett (Northmet Power Co.), thought supply authorities would welcome the standardisation of components. In suggesting standardisation up to 33 kV, however, he

felt the authors were going too far; 33-kV lines were still the backbone of many undertakings and very often had to carry a suspended pilot cable and probably telephone cables, and that could not be done on a single wooden pole with reasonable spans.

Mr. H. M. Lacey (E.R.A.) pointed out that the possibility of damage from lightning was not mentioned. Perhaps the authors did not consider the risk so great and were prepared to take it to eliminate the earth wire. A highly-insulated line where some use was made of the wood as insulation was less liable to receive a direct stroke than one in which there was earthed metal, but if it did receive a direct stroke, the effects might be conveyed directly to the substation. Possibly a compromise would be to have one or two poles at the substation where earthed metal was provided.

Authors' Replies

Mr. May, replying to the discussion, said that the paper was intended largely for post-war purposes and not for providing a wartime emergency standard. Therefore the comments with regard to home-grown wood poles hardly applied. Local circumstances would have to decide the conductor loading and if the conditions were very severe increased thickness would be allowed. He emphasised that the paper had been prepared from the point of view of the supply industry and nothing had been attempted which would help the manufacturer as regarded his costs. At the same time he felt he could safely predict that reduced costs of construction would bring about reductions in supply charges and that would mean more business for the manufacturers of all the components by reason of the increased demand.

Mr. H. Willott Taylor, in a brief reply, emphasised that the proposed design was not Edmundsons. They had been asked by E.R.A. to put up such a line and try it out under certain conditions. Before the war 47 per cent. of insulator spindles sold in this country were the same as those used by Edmundsons and therefore it seemed a reasonable standard to adopt.

Red Cross Appeal

Further Covenants and Donations

LAST week we published the first lists of covenanted subscriptions and donations made to the Red Cross Fund as a result of the appeal by the late Lord Hirst to all sections of the electrical and radio industries. Further substantial contributions have been received by the organisers and are noted below.

Completed covenant forms and donations should be sent direct to the Electrical Industries Red Cross Fund, St. James's Palace, S.W.1. Correspondence will be dealt with by the Joint Secretaries, Electrical Industries Red Cross Appeal, c/o British Electrical Development Association, 2, Savoy Hill, W.C.2.

Covenanted Subscriptions (gross)

	£	s.	d.
Brought forward ..	3,411	4	0
Standard Telephones & Cables, Ltd.	500	0	0
County of London Electric Supply Co.	500	0	0
Mather & Platt, Ltd.	500	0	0
W. T. Henley's Telegraph Works Co., Ltd.	250	0	0
Skefko Ball Bearing Co., Ltd. ..	210	0	0
Ultra Electric, Ltd.	200	0	0
British Power & Light Corporation	50	0	0
Tullis Russell & Co.	50	0	0
Claude-General Neon Lights, Ltd.	25	0	0
Abbott, Anderson & Abbott, Ltd.	25	0	0
Troughton & Young, Ltd.	21	0	0
Matthews & Yates, Ltd.	20	0	0
R. Cadisch & Sons	10	10	0
Rouch & Penny, Bristol	10	10	0
G. A. Davenport, Ltd.	10	0	0
Southern & Redfern, Ltd. ..	10	0	0
W. G. Robertson, Salisbury ..	6	0	0
Guy V. Laycock, Ltd.	4	4	0
Total	£5,813	8	0

Donations

	£	s.	d.
Brought forward ..	1,944	8	0
G. N. Haden & Sons, Ltd. ..	500	0	0
Hoffmann Manufacturing Co., Ltd.	500	0	0
Northmet Power Co.	105	0	0
British Industrial Plastics, Ltd. ..	100	0	0
Assn. of Steel Conduit Manufacturers	52	10	0
H. A. Lingard	25	0	0
Colne Electricity Committee ..	10	10	0
Hirst, Ibbetson & Taylor, Ltd. ..	10	10	0
S. D. Sullam, Ltd., London ..	10	0	0
Ensign Lamps, Ltd.	5	5	0
Advance Components, Ltd. ..	5	5	0
Wharfedale Wireless Works, Brighouse	5	5	0
Evans, Adlard & Co., Ltd. ..	5	0	0
H. Frost & Co., Walsall	5	0	0
E.D.A. (office staff)	4	0	0
Kinnaird & Co., Ltd., Greenock ..	2	2	0
Warrington Electrical Co., Ltd. ..	2	2	0
T. H. Rogers, Ltd., Llandovery ..	1	1	0
E.D.A. (per Mr. Reynolds) ..		16	9
Total	£3,293	15	3

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

I.E.E. Generation Section

THE suggestion made by Mr. T. H. Carr in your issues of February 5th and 12th regarding the formation of a "Generation Section" of the I.E.E. is most timely. It is surprising, in view of the specialised nature of generation since the 1926 Act came into force, that no such separate section has been formed as its claims to a specific group are surely as great as those subjects covered by the existing Sections.

Whilst supporting Mr. Carr I would go further and suggest that the increasing importance of the administration and management function would justify the formation of an "Administration Section." Discussion of administrative and management problems by electrical engineers would result in an integration of experience which would be of infinite value to members already holding executive positions and an ever-present reminder to junior members, early in their careers, of the importance of the science of management. A section of the Institution specially devoted to this purpose should act as an effective stimulus to the production of suitable papers.

Scunthorpe, Lincs. H. PEACE, A.M.I.E.E.

I AM interested in the proposal set out in Mr. T. H. Carr's letter in your issue of February 5th. My interest is, I know, shared by many members of the Institution of Electrical Engineers who are engaged on the generating side of our industry.

The need for a Power Station or Generation Section of the Institution is, I think, emphasised by the dearth of papers dealing with generation, the increasing number of papers on this subject contributed to other institutions and the lack of prominence given to power-station engineering in the examination papers.

Swansea. JOHN BRUCE.

A Central Information Bureau

FROM the number of questionnaires with which chief engineers are being continually bombarded, it must be obvious that there is much waste of time in the preparation, circulation and tabulation of many statistics, constituting a nuisance to busy people. There must inevitably be much overlapping in such activities, and the benefits to the industry as a whole are lost when questionnaires and tabulations are only circulated in and amongst a group of undertakings in a particular area.

When special information is required, it is a slow, inefficient and laborious business to circulate and tabulate questionnaires—apart from the exasperation caused to others who are so frequently called upon to fill up forms upon an infinite variety of subjects.

It is suggested that much time and expense could be saved by the establishment of a Central Information Bureau for the electricity supply industry, and possibly the Electrical Development Association could add to the usefulness of its activities by setting up such a Bureau. A sub-committee could determine the nature and scope of information to be collated and disseminated, but at the present time a quarterly return of tariff changes, changes in "key" personnel and reserve plant capacity would be of interest and importance.

It will probably be argued that staff limitations prevent anything being done on the lines suggested at present, but it is to be hoped that E.D.A. will bear the suggestion in mind when it is once more able to concentrate on matters relating to progress and development in the industry.

Swinton. H. C. BUSBRIDGE,
Borough Electrical Engineer.

[This matter is commented on in our leader section.—*Eds., Electrical Review.*]

Plastics for Lamp Posts

ALTHOUGH plastics have been used for about seventy years, progress in wartime has placed them on an entirely new footing. Instead of using metals we shall have to turn more to those very useful substances which can be squeezed into moulds and which do not require painting. In public lighting we shall probably have the all-plastic lantern, column, conduit and insulation. It is of the columns in particular that I wish to write. Let us hope that in the wealth of new work for the industry these will not be overlooked. Just think what unsuitable substances we have used in the past—gas pipes, cast-iron imitations of Grecian marbles, enamelled-iron stove pipes and, worst of all, heavy reinforced concrete.

Turning to the decoration of the lamp column. When we required such notices as "This Way to the Baths," we used to hang up a rusty glazed box, ugly even when the paint was new. Now the words can appear on the column itself illuminated from within. The bases of the luminous columns will no doubt be used for advertisements. Why should we not walk between lighted shop fronts on the one side, and show-case column bases on the other, in transparent

plastic material, brilliantly lighted up from the interior?

In an article in the *Electrical Review* of July 21st, 1939, I showed how the line of luminous columns, joining in the distance, in perspective forms a continuous bright background which serves to silhouette the traffic, in particular about the region of the kerb which is normally dark. This can best be demonstrated by a model similar to that illustrated in my article which makes use of mirrors to produce the effect of a very long stretch of road. This device has been developed in the research laboratories of a large electrical manufacturer.

Upminster, Essex. D. G. SANDEMAN, B.Sc., A.M.I.E.E.

The Central Register

I CAN assure the Ministry of Labour's Director of Public Relations that I have no illusions regarding his Department's registration activities and have a very live appreciation of the magnitude of its task, but the fact remains that the whole of the nation's engineering man-power is, by the Defence Regulations, at the Ministry's disposal, and it now remains for adequate organising ability to be applied to ensure the highest possible efficiency. Personnel is tied by the Essential Work Orders, so that public advertisements would seem superfluous.

In my letter published in the *Electrical Review* of December 25th, I charged the Ministry with attempting to "Sandhurst" the field of engineering by the creation of administrative and operative classes with perhaps an intermediate grade—or in plain English, "officers" and "other ranks." My strictures have been substantiated by the Select Committee's Report and more recently by the condemnation in Parliament of Civil Service organisation generally, whereby hide-bound classes are created and adhered to irrespective of ability.

It is noted that those with "a regular engineering training in industry who have attained a position of authority above the rank of foreman" will have reached an "equivalent standard" to the possession of academic qualifications or, if I may transcribe, a practical man who by years of effort, initiative and experience has climbed the ladder, will be deemed the equal of the fledgeling from the university and will no doubt be graciously allowed to place his hard-won experience at the latter's disposal.

It is appreciated that the "back room boys" are indispensable in their particular spheres, but let it be remembered that there are also those who, despite the fact that they chose the wrong fathers, have ability and, if allowed to develop, managerial capacity, men from the ranks like Mr. Ernest Bevin.

A.H.G.

[This correspondence is now closed.—*Eds., Electrical Review.*]

Cable Economy

Means of Saving Lead

INSTRUCTIONS have been issued by the Ministry of Supply that until further notice no armoured paper-insulated cable up to 22 kV shall be manufactured to a specification that allows for the use of more lead than does B.S. 480/1942, without the approval of the Electricity Commissioners as regards the electricity supply industry. In present circumstances very strong reasons will be required for approval of any departure from the Standard Specification.

Existing arrangements for obtaining authorisation for steel armouring remain in force. These instructions will apply to orders outstanding at February 4th to an extent appropriate to the stage of manufacture. No action by undertakings on such orders is necessary unless they are advised by suppliers to that effect.

The Cable Makers' (War Emergency) Technical Committee has considered the economies that can be effected in plumbing metal and also the elimination of lead sleeves in cable joints. The recommendations of the Committee (which have been approved by the Electricity Commissioners and are to be observed by cable makers and should be adopted by undertakings) are as follows :—

Lead sleeves should not normally be used for any low- or medium-voltage networks. Iron boxes and suitable compounds should be used for straight-through and service joints. Iron boxes appropriate to the next larger size of conductor and without lead sleeves should be used up to 3·3 kV. Cast-iron boxes should also be used where available for higher voltages up to and including 11 kV, when this would not involve special designs and patterns.

The quantity of plumbing metal used for lead-sleeved joints should not exceed 4 to 5 oz. per wipe per in. diameter of the cable sheath. Grade "D" solder (30 per cent. tin and 70 per cent. lead) is suitable for this purpose and also for sweating jointing ferrules. Plumbing metal for sealing filling caps of lead-sleeved joints should be used on the edge of the cap only. Alternatively, a window or flap can be cut in the lead sleeve and beaten down after the joint is filled with compound and then plumbed over. In this case a small vent hole must be made at the other end of the sleeve to allow trapped air to escape during filling and sealed afterwards. Economies are also possible in the use of metal in sealing cable ends at factories.

The Commissioners are also asking undertakings for information regarding the weight of copper and lead of any redundant cables in the ground, the cost of recovery, the excess of recovery cost over the value of the materials (taking copper at £50 and lead at £20 per ton) and the additional labour-time required.

PERSONAL and SOCIAL

News of Men and Women of the Industry

LAST week the General Electric Co., Ltd., announced that **Dr. A. H. Railing** had been elected chairman and joint managing director of the company in succession to the late Lord Hirst, and that **Mr. Leslie C. Gamage** had been made vice-chairman and joint managing director. **Messrs. T. Dyke** and **N. A. Enticknap** are temporarily to act as joint secretaries.

Dr. Railing has been with the G.E.C. since 1905. Before joining the company he gathered a good deal of works experience in the United States and on the Continent. In 1905 he went to the Witton Engineering Works as chief of the test department and two years later was transferred to headquarters as technical assistant to Lord Hirst. He was placed in charge of the

Dr. A. H. Railing

Mr. L. C. Gamage

Witton group of works as general manager in 1911, at the same time being appointed to the board. He retained this position when he returned to Magnet House in 1933 to take over further administrative duties and he became joint manager in 1941 and vice-chairman last year on the death of Mr. M. J. Railing.

Dr. Railing is a member of the Council of the Institution of Electrical Engineers and was vice-president for two years and he is on the management board of the Engineering Employers' Federation and the B.E.A.M.A. Council.

Mr. Leslie Gamage has been joint general manager of the G.E.C. since 1941, secretary since 1920 and a director since 1925. He was educated at Marlborough College and at Oxford, where he was senior scholar at Exeter College. He secured honours in his finals schools and took the M.A. degree in 1910. In 1913 he took honours in the Solicitors' Final Examination and later worked for a period with a chartered accountant.

He served with the 24th London Regiment during the last war. He was awarded the Military Cross, was twice wounded and was a prisoner of war. After his return to England he married Miss Muriel Hirst, the elder daughter of Lord Hirst. In 1920 he becamc secretary of the G.E.C. and upon his election to the board in 1925 the responsibility for the company's export business was added to his duties and on this account he travelled widely before the present war.

Mr. Gamage has been very active in the affairs of the Chartered Institute of Secretaries and served as president in 1941. He is president of the Institute of Export and a member of the Council of the F.B.I. He is a keen sportsman and has done much for the G.E.C. staff in the provision of facilities for sports and social activities.

Messrs. Dyke and Enticknap have both been with the company for many years.

News has now been received from Tokyo through the International Red Cross that **2nd Lieut. J. F. Herbert,** B.E. (Sydney), A.M.I.E.E., F.M.S. Volunteer Forces, and technical representative in the F.M.S. of the English Electric Co., Ltd., is a prisoner of war in Malaya. He is the son of Mr. A. S. Herbert (Herbert & Sons, Ltd., London, E.C.1).

Owing to the resignation of **Mr. J. L. Rooney,** second assistant station superintendent at Clarence Dock power station, Liverpool, the following re-arrangement of staff has taken place:—**Mr. E. H. Jones,** senior shift engineer, is appointed second assistant station superintendent; **Mr. T. H. Goold,** assistant shift engineer, becomes senior shift engineer; **Mr. A. R. Cain,** turbine engineer, becomes assistant shift engineer; and **Mr. S. Livingstone,** assistant turbine engineer, is promoted to turbine engineer.

Lowestoft Corporation has arranged for **Mr. H. H. Saunders,** the general manager of the electricity and transport undertaking, to remain in office for another year. He reached retiring age in April, 1940.

Mr. A. I. Baker, a director of Baker Perkins, Ltd., has been elected to serve on the Council of the British Engineers' Association.

At the annual general meeting of the British Trade Association held in Montreal at the end of December **Mr. C. G. Abbey,** president of Bepco Canada, Ltd., was elected president of the Association for the ensuing year. The British Trade Association is a branch of the Montreal Board of Trade.

Major Gladstone Murray has resigned from the position of Director-General of Broadcasting in Canada in order to take up public relations work. Up to 1936 he was with the British Broadcasting Corporation, first as Director of Public Relations and later as Assistant Controller. He then went to Canada to take up the appointment of general manager of the C.B.C. which he held until last August when he was appointed Director-General of Broadcasting.

Mr. T. E. Alger, managing director of R. Alger & Sons, Ltd., and a past-prisoner of the Electrical Contractors' Association, has been elected president of the Newport Chamber of Commerce.

Mr. H. Bewes, who has been chief clerk in the Bingley electricity undertaking for eleven years has been appointed to a similar position in the Luton Corporation Electricity Department.

Mr. T. McLauchlan of Stocksfield, Northumberland, has been appointed traffic superintendent

of Newcastle-on-Tyne telephone system in succession to **Mr. R. P. Lowe,** retired. Mr. McLauchlan was born at Stranraer, Wigtownshire, and joined the Post Office in 1911 at Edinburgh. He was transferred to Newcastle-on-Tyne in 1920. He was in executive control of the traffic arrangements for the conversion of the manual exchanges in the Newcastle-on-Tyne local fee area to the automatic system.

Obituary

Commander F. J. Campbell Allen.—We deeply regret to hear that the Admiralty has announced that Commander F. J. Campbell Allen, R.N., is missing, presumed killed. He had completed over two years' service in the Mediterranean area and was returning home to take up a new appointment when his ship was sunk by enemy action. Francis John Campbell Allen was fifty-five and entered the Royal Navy through H.M.S. *Britannia* in 1902 after being at school at Aldenham.

The late Cmdr. F. J. C. Allen

He served throughout the whole of the last war at one time in H.M.S. *Agincourt* and he was at Gallipoli in H.M.S. *London.* Although an executive officer he had a keen interest in those days in electrical engineering and was responsible for some innovations on the ships in which he served.

After retiring from the Navy, about 1920, Commander Allen was associated with the late Charles Orme Bastian and with him did much pioneer work in electric heating. This work was carried on under the name of the Bastian Meter Co. but soon became known as Bastian & Allen. After Mr. Bastian's death Bastian & Allen, Ltd., was formed in 1930, and Commander Allen became the joint managing director and chairman, a position which he held until 1939 when he relinquished it for the period of the war. He was one of the pioneers of electrode-boiler heating in this country.

Mr. Alfred Lindsay Forster, who died in Glasgow on February 10th, at the age of seventy-one, was a director of Chance Bros., Ltd., and its associated company, Glass Fibres, Ltd., Glasgow, until his retirement last year. He was a pioneer in the introduction to this country of the fabrication of glass silk, one of the uses of which is for insulation. Mr. Forster was a past-president of the Scottish Branch of the Institution of Mechanical Engineers and a member of the Institution of Electrical Engineers.

Lord Gainford, who died on February 15th at the age of eighty-three, was a director of a number of electricity supply companies including the County of London E.S. Co. and the South London Electric Supply Corporation, Ltd., of which he was chairman. He was Postmaster-General in 1916 and in 1922 became the first chairman of the British Broadcasting Company, holding the position until 1926 when he was appointed vice-chairman of the British Broadcasting Corporation, serving in that capacity until 1932. He was president of the Radio Manufacturers' Association in 1935 and of the Federation of British Industries in 1927-28. He is succeeded by his son Major the Hon. Joseph Pease.

Col. H. C. Fraser.—We report with regret the death at his home at Myddleton, Ilkley, on February 11th, of Col. Herbert Cecil Fraser, general manager of the Yorkshire Electric Power Co. and its associated companies.

The late Col. H. C. Fraser

Before joining the Y.E.P. Co. in 1919 Col. Fraser had had experience in electric traction and power station work. He was appointed general manager upon the death of Mr. W. B. Woodhouse in 1940. During the last war he served with distinction with the King's Own Yorkshire Light Infantry. He was twice wounded, and was mentioned in dispatches and awarded the D.S.O. He had been an active Territorial officer for many years and was hon. colonel of the 4th Battalion of the K.O.Y.L.I. which he had earlier commanded. He was a member of the West Riding T.A. Association and held the Territorial Decoration. He was made an O.B.E. in 1935.

He also found time to participate in I.E.E. activities. For many years he was hon. secretary of the North Midland Centre and was chairman in 1935-36.

Mr. W. Dundas.—We learn with regret that Mr. W. Dundas, city electrical engineer and manager at Bradford, died in hospital on Monday last. He had held the position for only two years, having succeeded the late Mr. T. Roles in 1941.

The late Mr. W. Dundas

Mr. Dundas was educated at the Birkenhead School of Science, the Northampton Institute, and the Manchester School of Commerce. He served an apprenticeship with the Liverpool Overhead Railway Co., and in 1902 became shift engineer (and subsequently mains engineer) with the Shipley U.D.C. Shortly afterwards he spent a period with Callender's Cable & Construction Co. and then, in 1905, was appointed engineer-in-charge with the Metropolitan Railway Co., later becoming electrical plant maintenance engineer.

In 1911 he joined the Manchester undertaking as shift charge engineer and after three years was placed in charge, as resident engineer, of the Dickinson and Bloom Street stations. Twelve years later he was given a similar position at the Barton station. He went to Bradford in 1929 as deputy city electrical engineer. Mr. Dundas was chairman of the North Midland Centre of the I.E.E. for 1939-40.

Wiring Large Buildings

Layout of Cables and Equipment.

THE planning and installation of wiring and circuit-controlling equipment in large multi-floor blocks of flats and offices are the subject of a lengthy paper presented by Mr. J. Flood in London to the Association of Supervising Electrical Engineers. In this the author says that engineers can only put into an installation the value of the work for which they are paid. The expenditure upon a good installation is a quite small proportion of the cost of the whole of the building structure and future installations in large buildings must be adequate to the service which is expected of them.

Three main switchboards should be provided, first, for the landlord's lighting, heating and power circuits; secondly, for the tenants' services and, thirdly, for emergency distribution needs. Network interconnectors with removable links at the top floor and basement levels would enable all services to be supplied from an alternative source by a different route.

Masonry fairways can be formed within the structure of the building to contain bare conductors as an efficient means of obviating the need for metal ducts fitted with removable cover plates and permit the safe current-carrying capacity of conductors to be increased without risk of harm, even if recommended ratings are exceeded.

Arrangement of Risers

From the busbar risers bare conductors are taken off through insulating sleeves packed with fire-resisting material for connection through a fuse-link box, or circuit-breaker, to a bus-chamber on each floor containing a protective distribution panel for outgoing sub-main cables and service wires on that floor.

Wherever two bus-bar risers are needed it is desirable to link them across at the top of the building so as to form a vertical ring main, cables being employed at their lower extremities where it may not be convenient to continue bars horizontally to the main switch room. For currents in excess of the 0·25 sq. in. cable rating it is recommended that cables of equal cross-section should be paralleled, because they will be more flexible to handle when being installed than a single larger cable.

Diversity of utilisation merits careful evaluation, while the capital cost of power factor correction is recoverable within three years; the author expresses preference for individual unit correction rather than bulk correction as a general rule when loads are variable and intermittent. The following table shows the order of diversity to be expected:—

DIVERSITY APPROXIMATION

Type of building	*Connected Load kW*	*Maximum Demand kW*	*Diversity per cent.*
House converted to four flats ..	60	15	25
Block of flats ..	900	125	21
Block of service flats	5,000	1,000	20
Large private residence ..	400	70	17·5
Block of offices..	2,000	700	35

Sub-mains should radiate from the bus-control chambers on each floor through triple-pole and neutral circuit-breakers, with provision for metering sub-circuits serving tenants' premises, and distribution boxes capable of taking 30-, 60-, or 100-A fuse elements with facilities for adding fuse-ways up to 50 per cent. of the original capacity of the installation.

Provision for Extensions

It is not usual in small and medium suites of flats and offices for tenants' demands to exceed the capacity of outgoing 19/·064 sq. in. v.i.r. feeder cables in semi-circular fibre duct grids; should they do so, then the load could be split for balancing the three phases. Duct area indicated by load estimation should be multiplied by a minimum safety factor of 1·5 in order to cover future requirements.

Circuit wiring in heavy screwed conduit concealed in the structure of buildings has been in many cases so inconvenient to get at for alterations that tenants have been deterred from proceeding with extensions. The author considers that properly planned combinations of under-floor ducts and false ceilings will allow wiring outlets to be conveniently re-arranged and extended at will.

In his comments on protective earthing the author points out the inadequacy of existing recommendations, which are not always practicable. The author suggests voltage reduction as the best way to minimise danger in bathrooms, employing a 230/25-V double-wound step-down transformer with its secondary winding earthed at the mid-point to ensure that potential to earth will not exceed 12·5 V.

The paper stresses in conclusion the need for the registration of electrical operatives and official certification of all electrical materials.

NEW BOOKS

Valve Principles. Switchgear Treatise for Non-Specialists.

Introduction to Valves. By F. E. Henderson, A.M.I.E.E. Pp. 112; figs. 130. Published from the offices of the *Wireless World*, Dorset House, Stamford Street, S.E.1, on behalf of the General Electric Co., Ltd. Price 4s. 6d.

During the past few years many of those in the Services and in industry have found themselves called upon to handle and operate thermionic valves of various types with little opportunity of acquainting themselves with any basic information on their principles and construction. This manual should do much to remedy the omission. It assumes only a fundamental knowledge of electricity and magnetism, and practically no mathematics.

Starting with the simple diode, the book takes us successively through the simple theory of valves of increasing degrees of complexity, and at the same time indicates the purposes for which they are used, and the circuits associated with them. In general the book is confined to radio receiver practice, although there is a certain amount of information on transmitter valves. Throughout the book characteristic curves of valves are used to explain their working, and it is noticeable that constructional features are explained in rather more detail than is normally found in a comparatively elementary book.

Tnere is a short chapter on small mercury-vapour rectifiers and gas-filled relays, and two on cathode-ray tubes, the final chapter dealing with current and voltage stabilisers. For those who wish to pursue their reading farther, there are three pages of selected references to text-books and papers on various aspects of the subject, and the book concludes with appendices of symbols and useful formulæ.—W. E. M.

Switchgear Practice. By Arthur Arnold. Pp. 238; figs. 133. Chapman & Hall, Ltd., 11, Henrietta Street, London, W.C.2. Price 22s.

The rapid progress of switchgear development during the past ten to fifteen years, and the likelihood of even greater development in the future, makes new literature on the subject always welcome. There has never been a spate of books on this now all-important subject, which at one time was the Cinderella of electrical engineering. As the author so rightly points out, electrical switchgear enters into every industry, and while every engineer cannot hope to be a specialist in all the many items of equipment which come within his sphere of work, it is nevertheless essential that he should have more than a passing knowledge of switchgear, which has aptly been described as the "nerve centre" of any electrical installation. We welcome, therefore, Mr. Arnold's book because it adds to the too few books which deal with an extraordinarily complex subject and is written in a manner helpful to the non-specialist user.

Of particular interest, in these days of advanced knowledge, are the chapters on arc control devices, methods of circuit-breaker operation, switchgear testing, and fire prevention and protection. In the chapter on heavy-duty oil circuit-breakers the theory of arc interruption under fault conditions is dealt with simply and yet fully enough for all except those who are specialising in the art. It is, however, a pity that Mr. Arnold does not deal more fully in this chapter with the ways and means of making short-circuit calculations and at the same time lay greater stress on the known difficulties of closing a circuit-breaker on to an existing short-circuit. It is a pity, too, that the chapter on oil-less circuit-breakers should be confined to Continental types, giving the impression that British designers are lacking in initiative. This is not true, although to cover his subject more fully the author would need to alter his chapter title to "Low Oil Content and Oil-less Circuit-Breakers." The oil-less circuit-breaker is not the panacea for all switchgear ills, an impression which may be gained where description is confined to those types developed on the Continent. In spite of these criticisms the book is an excellent work for the user who cannot hope to specialise and for the student who wants to include a study of switchgear in his training—a study which unfortunately no school or polytechnic undertakes, unless it be to describe a knife switch or a motor starter. If the book goes into a new edition, it is suggested that the author should include in his bibliography a number of books for study, in addition to papers, reports, etc. Very few ordinary readers of the book can have copies of, or even access to, the majority of the articles or papers, whereas books can nearly always be obtained.—R. T. L.

Warne's Wages and Overtime Calculator. By H. S. Stillwell. Frederick Warne & Co., Ltd., Chandos House, Chandos Street, London, W.C.2. Price 6s.

Compiled to meet the demand for a simplified system of working out total wages to be paid for time and overtime for the different schedules prevailing in many trades and industries, this book includes wages calculations giving rates of wages from 1/40th to 100 hours at 3d. to 3s. per hour. The overtime chart simplifies methods of calculation by means of an hourly values method, which gives a high degree of accuracy in working out total wages to be paid, including overtime. The chart shows overtime rates reduced to normal hours for time plus 1/10th to double time, and for percentage increases from 10 to 100 per cent.—W. R. C.

Lasting Peace and a Better World: A Plan to Achieve Them. By E. T. Williams, O.B.E., M.I.E.E. Pp. 142. The Victory Fellowship, 1, Overlinks Drive, Parkstone, Dorset. Price 1s. 6d. (boards), 2s. 6d. (cloth).

In this thoughtful work the author puts forward his ideas on national and world organisation after the war. He covers all aspects of life, economic and social. One interesting section deals with the Central Electricity Board, an organisation which embodies many principles put forward by the author in an I.E.E. paper in 1916. Mr. Williams considers that this form of corporation could be extended to other public utilities (including a separate board for coal, gas, oil and other fuels), to social services, and to agriculture, industry and trade.—J. H. C.

COMMERCE and INDUSTRY

Conserving Fluorescent Lamps. Works Administration Aid.

Fluorescent Lamp Economy

OWING to the need for conserving 5-ft. fluorescent lamps and ensuring that they are used in connection with work essential to the war effort, the members of the Electric Lamp Manufacturers' Association have agreed to limit their sales to lamps for use in new lighting installations of an essential nature, or to replacement lamps for existing installations.

Wholesalers and resellers are asked to adopt a similar attitude in connection with the distribution of these tubes, and only supply them for new installations which they know to be essential to the war effort or as replacements in existing installations.

Shipyard Electricians' Wages

Following upon the meeting reported in our last issue, a conference was called last week by the Ministry of Labour and National Service of representatives of the Electrical Trades Union and the Shipbuilding Employers' Federation to discuss rates of pay for electricians in shipbuilding and ship-repairing yards. It was announced that agreement had been reached upon a system of payment by results to come into operation on February 22nd and to remain in force for the duration of the war.

Women's Technical Service Register

All women who have reached the School Certificate or equivalent standard in mathematics, chemistry, physics or general science and who feel that their present occupation is not using their qualifications to the full are asked by the Ministry of Labour and National Service to enrol on the Women's Technical Service Register. This is with a view to their transfer to such work as engineering draughtsmanship, laboratory work, and production planning, etc., after the necessary training. Women with specially good workshop experience may also apply. A leaflet (P.L.101/1943) about the Women's Technical Service Register can be obtained from any Employment Exchange or from the Appointments Department of the Ministry of Labour and National Service, Sardinia Street, Kingsway, London, W.C.2.

Unprotected Transformer Terminals

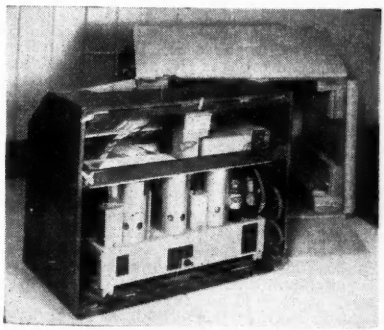
At Newcastle-on-Tyne Police Court Messrs. C. A. Parsons & Co., Ltd., of Heaton, were fined £75 and £1 11s. costs for a breach of the Electricity Regulations under the Factory Act. The case was a sequel to an accident in their works on November 21st last, when William Davidson, a workman, was killed through touching the high-voltage terminals of a transformer under test.

Mr. A. G. Lotinga, a Factory Inspector, said that the terminals of the transformer were unprotected and that the prescribed precautions had not been carried out. Evidence was given by two workmen and by Mr. Frederick Murgatroyd, Electrical Inspector of Factories, who said that he had inspected the transformer and found that the terminals had been neither caged nor boxed.

Mr. G. H. Linsley, who defended, pleaded "not guilty," but called no witnesses. He said that the company had adopted what it considered proper precautions including a red warning light and a verbal warning which had to be acknowledged. In view of the accident, however, added precautions would be taken.

A Sturdy Radio Receiver

The accompanying illustration shows a G.E.C. "Overseas 6" radio receiver and its original packing. Protected only by the light wooden case and carton, the receiver has spent many rigorous months on the battle fronts of the Middle East. Through all the hazards of modern warfare it accompanied its owner—a senior officer of a signals unit—providing news and other welcome programmes (mostly short wave). Apart from occasionally being cleared of



A G.E.C. "Overseas 6" radio receiver which has done excellent service in the Middle East

fine sand which penetrated to almost every part of the cabinet and chassis no "running repairs" were made. Perhaps the most remarkable escape was when the officer's car, then being driven over the desert, struck a land mine. By a stroke of good fortune both the officer and his companion were almost unscathed, and the receiver in its packing case was thrown well clear of the debris.

Industrial Design Meetings

The Design and Industries Association is holding a series of monthly lunch-time meetings at the Royal Society, Burlington House, Piccadilly, London, W.1, from 1.30 to 2.30 p.m., preceded by a buffet lunch. The programme is as follows :—March 2nd : "Design and Mass Production," by Mr. H. Strauss, M.P. April 8th : "National Design in Printing," by Mr. F. Meynell. May 11th : "Industrial Design and the Public," by Mr. T. Harrison. June 10th : "The Future of Industrial Design," by Mr.

H. Read. Further particulars can be obtained from the secretary of the Association, c/o Central Institute of Art and Design, the National Gallery, Trafalgar Square, London, W.C.2.

Factory Office Organisation

Efficiency in production depends very largely upon administrative methods, and wartime expansion, coupled often with a depletion of staff or the engagement of people unfamiliar with the work, has created a need for guidance in the organisation and running of works offices. The matter has been under consideration by the British Standards Institution, with the approval of the Ministry of Production. A committee was set up to deal with the matter and make recommendations on the most efficient procedure designed to promote simplification and greater efficiency in the clerical side of works production and organisation. The subject has been studied, in the first instance, from the point of view of the engineering and allied industries and the Committee, through expert sub-committees, has in course of preparation a number of booklets dealing, *inter alia*, with factory production control methods, costing systems, industrial purchasing, storekeeping, receiving, despatching, invoicing, pay-roll methods and office practice and organisation. The booklets will be published at 6d. each, post free, but the Institution states that remittances should not be sent until publication is announced. The B.S.I. Committee will endeavour to give additional information or guidance on points arising out of the booklets. Inquiries should be addressed to the B.S.I., 28, Victoria Street, S.W.1.

Utility Flexible Cables

As a substitute for tough-rubber-sheathed flexible cables the Sterling Cable Co., Ltd., has developed a type which contains no crude rubber. This is available in three conductor sizes, *viz.*, 9/·012, 16/·012 and 28/·012, and with two, three or four cores, which are coloured for identification in black, red, brown and yellow. The insulation and covering are of rubber, resilient compound and braided bitumen. The new cable is available only to firms engaged on vital war work. Orders need not be endorsed, but should be accompanied by Certificate 111.

Copper Resources

A Combined Copper Committee has been set up by the United States, Great Britain and Canada for the collection and review of information relating to the requirements, stocks and consumption of copper as a means of ensuring the best allocation of the metal. The chairman of the Committee is Mr. H. O. King, director of the Copper Division of the United States War Production Board.

Gas Industry Directories

The 1943 edition of the " Register of the Gas Industry " contains much useful information for those engaged in the gas industry. It is divided into two sections, the first being a directory of gas associations, officials and gas undertakings in the British Isles. The other section includes a number of technical articles relating to gas production and appliances. There is also a " Where to Buy " section.

The " *Gas Times* Pocket Directory, 1943," includes lists of gas associations and gas undertakings and alphabetical lists of products and services with the maker's name and address and a trade name directory.

Both these directories are published by Hallows & Slaughter, Ltd., 29, Grove Road, Leighton Buzzard, Beds.

Supply Authorities' Accounts

The ban on the publication of their accounts by electricity supply authorities has been lifted to the extent that they may now furnish copies or extracts to the Secretary of the Share and Loan Department of the London Stock Exchange. The Secretary may also pass these on to any member of the Exchange who can give satisfactory reasons for requiring them.

Russian Delegates at G.E.C. Works

Major Roudoi, a member of the Soviet Military Mission, together with Messrs. Sliozberg and Tomilin, two Russian delegates to this country, recently visited G.E.C. factories in London where they were introduced to the workers by Mr. G. Chelioti. Replying, Major Roudoi, who was in Stalingrad a short time ago, said that " Victory this year " was the slogan of the day. The party first inspected the works' members of the Home Guard and then for five hours toured the factories where the machines, processes and products were explained to them in detail.

High-speed Steel

Darwins, Ltd., referring to a recent announcement by the High-Speed Steel Association that makers are now ceasing to produce the " 66 " quality of molybdenum high-speed steel and are substituting the " 4-6 " quality, state that the latter is identical with their " Morex " high-speed steel. In this connection they offer users copies of their publication No. 132 containing comprehensive information regarding the working and heat treatment of " Morex."

Calendar

Easco Electrical Service is making a nominal charge of 3d. for its 1943 calendar, and all proceeds will go to the Prisoners-of-War Fund.

TRADE MARK APPLICATIONS

RECENT applications for British trade marks include the following, objections against which may be entered within a month of February 10th :—

C.L.C. (design). No. 620,703, Class 9. Scientific, nautical, surveying, optical and signalling apparatus and instruments, electrical apparatus and instruments not included in other classes and parts (not included in other classes) of all the said goods.—Langham Components, Ltd., 95, Great Portland Street, London, W.1.

BUSLAY. No. 620,464, Class 9. Electric relay systems for use in primary electric circuits for protecting such circuits against faults.—Metropolitan-Vickers Electrical Co., Ltd., 1, Kingsway, London, W.C.2. To be associated with No. 620,466 (3385) ix and another.

TESTLAY. No. 620,466, Class 9. Equipment for testing electric relays.—Metropolitan-Vickers Electrical Co., Ltd., 1, Kingsway, London, W.C.2. To be associated with No. 620,464 (3385) ix and another.

Partnership Pitfalls

Guarding Against Unanticipated Liabilities

By F. E. Sugden, A.C.I.S., Barrister-at-Law

RECENTLY I was directly concerned in an action, in a professional capacity, in which two persons who had purchased some leasehold property on the strength of representations made by a firm of estate agents, were awarded damages against the agents on the grounds of misrepresentation. The alleged misrepresentation took place in September in one year ; in the preceding May the firm of estate agents had taken in a new partner who had no knowledge whatsoever of the transaction on which the action was based.

The High Court Judge decided, however, that as he was in the partnership at the time, and *inter alia* was present at least at one interview when this business transaction was arranged, he was liable with the remaining partners for the misrepresentation of the firm. Whilst the Judge expressed regret at this partner's predicament, the position was inevitable.

Prior Investigation Essential

I quote this case as a preface because many electrical contractors may be tempted to enter into partnership with other contractors with the object of obtaining additional capital. Speaking as a lawyer, I am inclined to be against partnerships owing to this risk, but if the contractor has made up his mind all I can do is to give him advice and warn him against the pitfalls which may exist.

Before entering into a partnership a contractor should first make a full investigation of the books of the concern to find out which are good and which are bad debts, and what the firm's commitments are. There should be an arrangement as regards liabilities which were created before the date of his entry into the partnership. The contractor should first of all be guided by a lawyer as regards legal commitments and a competent accountant as regards the financial side of the business.

The provisions of the Limited Partnership Act, 1927, should be followed as far as possible, and articles of partnership should be carefully drafted in order that existing and future contingencies may be covered. It might be thought that this course would be taken naturally, but, speaking from professional experience, I am astounded at the looseness of the arrangement of a large number of partnerships. Certain leases should be carefully scrutinised, especially where dilapidations are concerned, in order to ensure that the new partner is not entering into impossible terms. Partners are generally liable both jointly and severally for the debts of the partnership, and if one partner defaults the remaining partners are individually liable.

The Limited Partnership Act, 1927, lays down that a limited partnership must not consist of more than twenty persons and must have one or more persons called " general partners," who shall be liable for all the debts and obligations of the firm, and one or more " limited partners " who shall contribute a sum as capital or property valued at a stated amount. The latter are not liable for the debts and obligations of the firm beyond the amount so contributed.

A limited partner cannot, during the existence of the partnership, draw out or receive back any part of his contribution, and he must not in any way interfere with the working of the business. Also, the person who is a limited partner must be registered, and the register must be regularly kept up to date, so that the public may be fully acquainted with the facts concerning a limited partnership as in the case of an ordinary limited liability company. That means to say that a member of the public, or at least any person who is having business relations with the partnership, is entitled to ascertain the composition of the limited partnership, with the object of knowing to whom, if anybody, he can look for the satisfaction of his debts in case of emergency.

Methods of Dissolution

The articles of partnership frequently lay down how a partnership shall be dissolved. Subject to any such terms, however, a partnership is dissolved—(1) if entered into for a fixed time, by the expiration of that time ; (2) if entered into for a single undertaking by the termination of that undertaking ; (3) if entered into for any undefined time by any partner giving notice to the other or others of his intention to dissolve the partnership, or by mutual consent of all the partners ; (4) by the death or bankruptcy of any partner ; and (5) by a partner suffering his share of the partnership property to be used for his separate debt. A partnership will also be dissolved upon the happening of any event which makes it unlawful for the business of the firm to be carried on, or by the members of the firm to carry it on in partnership.

The Courts have the power to dissolve a partnership (a) when a partner becomes a lunatic or incapable of performing his part of the partnership contract ; (b) when a

partner has been guilty of conduct prejudicially affecting the carrying on of the business of the firm ; (c) when a partner is guilty of wilful misconduct ; (d) when the business can only be carried on at a loss ; and (e) when circumstances have arisen which render it just and equitable that there should be a dissolution.

When a dissolution of partnership takes place, and, unless there are special arrangements between the parties to the contrary, the whole of the partnership property is converted into money which is disposed of as follows :—(1) The debts and liabilities of the firm must be paid ; (2) if the money has been advanced by any of the partners beyond the amount of his share of the capital, the advances must be repaid ; (3) after the above claims have been satisfied, each partner is entitled to receive the share of the capital which is due to him ; (4) any residue is divided among the partners according as they are entitled to share in the profits of the business. The method of sharing profits in a partnership is usually governed by the articles of partnership. If no mention is made of such a point, then the profits are usually divided in the ratio that each partner has contributed to the capital of the partnership.

I would impress on the electrical contractor that properly drawn up articles of partnership will prevent much costly litigation in deciding how the profits shall be divided, or, if the partnership is wound up, how the proceeds shall be dispersed. But more important still, they will stipulate how the remaining partners shall face the liabilities where they are general partners as distinct from limited partners.

Tariffs in Tasmania

Financial Effect of Uniform Rates

A SERIOUS decline in revenue from rural consumers, mainly as a result of the introduction of uniform charges throughout the State, is recorded in the annual report of the Hydro-Electric Commission of Tasmania for the year ended June 30th last.

The report, which has arrived in this country several months earlier than usual, states that, with the transfer of the Ross Council's undertaking, the Commission now provides a retail supply at uniform rates in 39 municipalities. Only one—Launceston—continues to take a bulk supply, and if State uniformity is to be achieved it will be necessary for this undertaking also to be transferred in order that the profits may be used for the improvement of the Commission's service as a whole.

Loss on Rural Service

Dealing with the effect of uniform charges in rural areas, the report shows that notwithstanding the addition of 1,263 consumers to the Commission's rural retail service, increased sales to existing consumers and special wartime revenue, the total income from these areas decreased by £14,486 last year. An analysis of the cost of supplying 943 rural consumers, mostly in townships and, therefore, relatively easier to serve than prospective consumers, reveals that at the uniform rates prescribed by the Hydro-Electric Commission Act the revenue was £5,143 while the annual cost of supplying the service was £11,902.

To meet this loss, consumers in more densely populated areas must pay higher charges than would otherwise be necessary. The Commission is of the opinion that as the present method of providing assistance for rural extensions encourages the provision of supplies which after the guarantee period become a heavy burden on existing consumers, the Act should be amended to provide for definite Government contributions towards the capital cost of the work. In this connection the report refers to " the grants in aid " up to 50 per cent. which are made by the Government of Ontario to the Hydro-Electric Power Commission there.

Total revenue of the Commission during the year under review was £722,483, an increase of £40,910, and working expenses rose by £35,213 to £225,077. After providing for capital and other charges of £460,966 (£33,405 more than in the previous year) there was a balance of £36,440. Explaining a decision to transfer £31,000 of this to reserve to meet contingencies, the report expresses the view that the decline in revenue from rural consumers will not be made good for many years and as there are other increased expenses, some of which were only charged in respect of part of the year, the Commission considers that much less favourable results will be disclosed at the end of the current year. The Auditor-General in his report for 1940-41 had remarked that the Commission could apparently make as large a contribution as it liked to the reserve fund and thus absorb most of the annual profits. The Commission suggests, however, that obviously the adequacy or otherwise of the reserves is a matter which it alone can determine.

Output Figures

With regard to output, the report states that 730 million kWh was generated by water power in the State during the year. On the basis of a population of 240,000 the average *per capita* was 3,042 kWh, a figure only exceeded, the Commission believes, in one, or possibly two, countries. The Commission itself generated 661·7 million kWh as compared with 596·9 million kWh in the previous year, sales amounting to 540·3 million kWh against 505·1 million kWh in 1940-41. The system peak load rose from 94,900 kW to 103,800 kW.

No details are given of the progress of constructional works, but it is stated that considerable delays have been experienced in the manufacture of the main equipment overseas. According to recent advices, however, manufacturers in England, in the face of unprecedented difficulties, have brought the Commission's orders to an advanced stage of completion.

ELECTRICITY SUPPLY

Duplicated Food Advice. Weymouth Showroom Dispute

Dorchester.—EXCESSIVE CONSUMPTION.—At a meeting of the Electricity Committee the Town Clerk submitted a list of persons who were apparently using an excessive amount of electricity. It was decided that the Town Clerk should send personal letters to a few of the people concerned.

Ilfracombe. — MODIFIED LIGHTING. — The Highways Committee has been asked to submit a scheme for modified lighting in the main streets.

Oldham.—DOMESTIC CONSUMPTION REDUCED. —At a meeting of the Electricity Committee it was reported that as a result of the appeal for economy in the use of electricity there had been a decrease of 6·1 per cent. in the amount used for domestic purposes in a month.

Paisley.—COUNCIL'S PROTEST.—The Town Council is protesting to the Ministry of Fuel and Power against the setting up of a Food Advice Centre in the town by the Ministry of Food. Mr. Daniel Ross, electricity manager, reported that the Centre was really duplicating a service which the Electricity Department had been maintaining for some time at its showroom. There was no necessity, he considered, for this duplication, especially in view of the desire of the Government to economise in finance, man-power and fuel.

Penmaenmawr.—ELECTRICITY CHARGES.—It was stated at a meeting of the Urban District Council that the belief was prevalent that the electricity undertaking was making sufficient profit to warrant a reduction in charges. The chairman of the Electricity Committee held out no hope of a reduction, however, until the reserve funds had been well established. The situation will be reviewed again at the end of the year.

Torquay.—REQUISITIONING OF LAMP STANDARDS.—Inquiries have been made by the Ministry of Supply as to the possible requisition ing of 22 public lighting standards at Newton Abbot for scrap. Reporting on this matter the Electricity Committeee stated that the estimated value of these standards was £40 each, while the rate of payment under the requisition would be approximately between 10s. and 15s. per standard. It was decided to press for a more adequate rate of compensation and also to point out the importance of retaining the facilities so as to enable the Committee to restore public lighting as speedily as possible after the war.

Weymouth.—LIBRARY AT SHOWROOMS.—In spite of opposition from the Electricity Committee the Town Council has decided by 25 votes to 10 to establish a reference library and to utilise part of the electricity showrooms. Under the scheme outlined in the Finance Committee's recommendations, arrangements will be made for the present staff of the showrooms to supervise the library and be paid in respect of overtime performed on the work. Alderman E. A. Phillips, chairman of the Electricity Committee, moving the reference back of the report, said that in the event of an emergency extra accommodation might be necessary and if the space in the showrooms were taken they would have to go somewhere else. Councillor H. A. Bond declared that it would be a retrograde step to use the showrooms and Councillor A. C. Billett claimed that the use of the showrooms for library purposes would mean the curtailment of the activities of the Electricity Department. Among the supporters of the Finance Committee's recommendations were several members who have been championing the cause of library facilities for many years.

Overseas

Canada.—ONTARIO POWER SCHEMES—Mr. M. J. McHenry, director of sales and priorities for the Ontario Hydro-Electric Power Commission, stated recently that the Commission had spent $50,000,000 on new plants and extensions since the beginning of the war, but the additional power produced had not been sufficient to keep up with increased demands.

South Africa.—TARIFFS AND COSTS.—In a comprehensive report on tariffs recently submitted to Durban City Council the city electrical engineer asserts that for some years to come the cost per kWh sold is likely to rise and revenue to fall. Extensions to the Congella power station are bound to raise the maximum demand charge payable to the Electricity Supply Commission (to meet this a tariff adjustment fund account was established in 1936), and after the war additional maintenance work and wage advances will increase operating costs. Furthermore, a state of development has been reached at which heavy capital expenditure becomes necessary; but for the war, extensive modernisation and addition to the distribution system would have begun. The progressive diminution in the proportion of electricity used for lighting has also reduced the average revenue and the engineer is of the opinion that this trend will be intensified by the increasing use of fluorescent lighting. After considering this report the City Council has decided to defer any decision on tariff adjustments until the financial implications of the extensions in hand at Congella are available.

E.R.A. Annual Meeting

THE annual meeting of the British Electrical and Allied Industries Research Association was held on February 12th. In moving the adoption of the report (which was reviewed in our last issue) Mr. C. Rodgers said that altogether something like a hundred different types of research had been carried on. He paid a tribute to the pioneers of the Association—Messrs. D. N. Dunlop, A. R. Everest, C. P. Sparks and C. H. Wordingham, to Sir Frank Heath, the first head of the Department of Scientific and Industrial Research and to Mr. Hetherington, representative of the D.S.I.R. on the Council.

Mr. Rodgers also spoke highly of the work of the staff and said that the success of this work had depended to a very large extent upon the director, Mr. E. B. Wedmore.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Heenan & Froude, Ltd.—Approximately 86 per cent. of the issue at 8s. each of 300,000 5s. ordinary shares has been subscribed by shareholders who were allotted one new share for every three held. The balance will be taken by the Industrial & Finance Corporation which underwrote the issue for a commission of 4½d. per share.

The Bristol Tramways & Carriage Co., Ltd., reports a net profit for 1942 of £210,327, a decrease of £8,070, as compared with 1941. The final dividend on the ordinary is 5 per cent., maintaining the distribution for the year at 10 per cent.

Mather & Platt, Ltd., are again paying a final ordinary dividend of 6 per cent. making 10 per cent. for the year (unchanged) and in addition a distribution from special reserve account of 1 per cent. on account of realisation of capital profit is being paid.

British Industrial Plastics, Ltd., report gross profits of £295,798 for 1941-42 (against £169,124 and a net profit of £21,424 (against £15,989) after meeting depreciation and taxation charges, etc. The ordinary dividend is raised from 6 to 8 per cent. and £6,698 is carried forward.

The London Electric Supply Corporation, Ltd., is paying a dividend of 6 per cent. on the ordinary shares for the year ended December 31st. In the previous year an interim dividend of 3 per cent. was paid, followed by a final of 3 per cent.

The City of London Electric Lighting Co., Ltd., is paying a final ordinary dividend of 4 per cent. again making 7 per cent. for the year.

The Northampton Electric Light & Power Co., Ltd., is paying a final ordinary dividend of 6 per cent., actual, making 10 per cent., less tax, for the year.

The Rushden & District Electric Supply Co., Ltd., has announced a final dividend of 5 per cent., actual, making 9 per cent., less tax, for the year.

Clarke, Chapman & Co., Ltd., are paying a dividend of 12½ per cent. for the past year, as in the preceding year.

New Companies

L. Westacott Davis, Ltd.—Private company. Registered February 10th. Capital, £1,000. Objects : To acquire the business of manufacturers' agents and wholesale radio distributors carried on by the exors. of the late L. W. Westacott Davis at Burlington House, 88, Redcliffe Hill, and Guinea Street, Bristol, as L. Westacott Davis, and to carry on the business of radio, electrical, motor and general engineers, etc. Directors : R. F. O. Smith, 11, Hill View, Henleaze, Bristol ; R. H. V. Cave, Ten Downleaze, Stoke Bishop, Bristol 9 ; and A. A. Davis and E. Westacott Smith, addresses not stated. Solicitors : Benson, Carpenter & Co., Bristol.

Correx Communications Equipment, Ltd.—Private company. Registered February 6th. Capital, £500. Objects : To acquire the business of wireless, electrical and research engineers, etc. carried on by L. H. H. Cooper, as Correx Amplifiers at Peckford Place, Brixton, also to carry on the business of manufacturers of, and dealers in, medical equipment, etc. Subscribers : L. H. H. Cooler and G. B. Redgrave, both of 12, Peckford Place, London, S.W.9. Solicitors : Benham, Synnott and Wade, Suffolk House, Laurence Pountney Hill, London, E.C.4.

Dybrook Electrical Industries, Ltd.—Private company. Registered February 5th. Capital, £100. Objects : To carry on the business of electrical, mechanical, radio, television and general engineers, etc. Directors : L. G. Bradbrook, C.A. and E. F. Bradbrook, both of 805, White House, Albany Street, London, N.W.1. Registered office : 23, Angell Road, London, S.W.9.

Copperad, Ltd.—Private company. Registered February 5th. Capital, £100. Objects : To carry on the business of heating, ventilating, air-conditioning, refrigerating, drying and electrical engineers, etc. Directors : J. P. Tilley, C.A., Ranworth, Oxshott, Surrey, A. Wilyman, Wykham Park Lodge, Banbury, Oxon (director of British Unit Heater Co., Ltd.) and E. B. T. Tanner, Garden Cottage, Quarry Wood Hall, Marlow, Bucks (director of same company). Registered office : Pinners Hall, Austin Friars, London, E.C.2.

Medicalectric Appliances, Ltd.—Private company. Registered February 9th. Capital, £1,000. Objects : To carry on the business of manufacturers of X-ray and electro-medical apparatus and accessories, etc. Subscribers : H. A. Sales, 16, George Street, Berkhamsted, Herts, and F. F. Baker, 15, Church Hill Road, Solihull, Warwickshire. Solicitors : Wallace Robinson & Morgan, Birmingham. Registered office : 126, Colmore Row, Birmingham.

Polyplastics, Ltd. — Private company. Registered February 2nd. Capital, £3,000. Objects: To carry on the business of manufacturers of, and dealers in, plastic materials and articles, mechanical, electrical, and general engineers, etc. Directors: S. Avery, "Little Clare," Barton Lane, Barton-on-Sea, and A. Korach, 4, Eton Avenue, N.W.3.

Hertfordshire Plastic Co., Ltd.—Private company. Registered February 1st. Capital, £1,000. Objects: To carry on the business of manufacturers of ebonite, vulcanite and plastic substances and goods, chemical, textile, electrical and general engineers, manufacturers of, and dealers in, automobiles and radio instruments and accessories, etc. Subscribers: Hertfordshire Rubber Co., Ltd., Letchworth, Herts; J. Entwistle, "St. Albans," Broadway, Letchworth and H. Rose, 39-41, New Broad Street, London, E.C. 2. Solicitors: Cripps, Harries, Hall & Co., 2, King's Bench Walk, London, E.C. 4.

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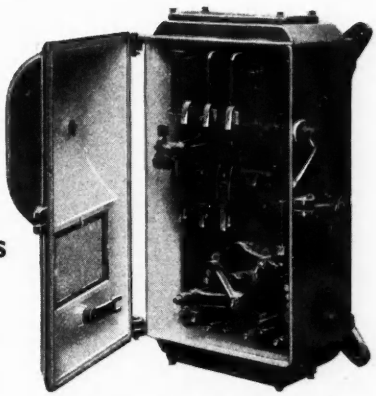

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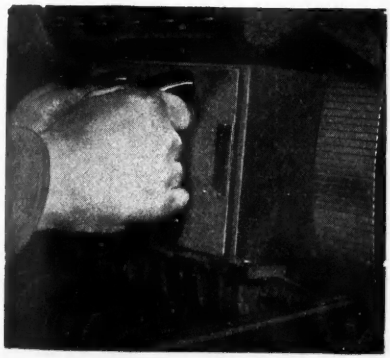

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Cornercroft (Plastics), Ltd.—Private company. Registered February 2nd. Capital, £100. Objects: To carry on the business of manufacturers, producers and moulders of, and dealers in, plastic materials and goods, vulcanite, ebonite, etc., electricians, manufacturers of, and dealers in, radio and telephone supplies, etc. Subscribers: N. Rycroft, "Four Winds," Blackdown, near Leamington Spa, and J. A. Corner, "Fieldgate Lawn," Kenilworth. Solicitors: Sidney F. Snape & Co., 105, Little Park Street, Coventry.

Tri-Com Patents, Ltd.—Private company. Registered February 4th. Capital, £100. Objects: To acquire any patents relating to the application, distribution and use of electricity and any apparatus therefor, and to carry on the business of electrical, mechanical, motor and general engineers, etc. Directors: G. H. Wilson, Belcombe, Saxlingham, Nethergate, near Norwich, P. A. Mossay, 189, Newmarket Road, Norwich and P. A. Bainbridge, address not stated. Solicitors: Mills and Reeve, Norwich.

Companies' Returns

Statements of Capital

Witton-James, Ltd.—Capital, £6,100 in 2,000 preference and 4,000 ordinary shares of £1, and 2,000 deferred shares of 1s. Return dated September 1st. All shares taken up. £2,000 paid on 2,000 preference shares. £4,100 considered as paid on 4,000 ordinary and 2,000 deferred shares. Mortgages and charges: £25,000.

Dubilier Condenser Co. (1925), Ltd.—Capital, £500,000 in 500,000 preference shares of 10s. each and 5,000,000 ordinary shares of 1s. each. Return dated October 28th. 200,000 preference and 1,539,375 ordinary shares taken up. £176,968 15s. paid. Mortgages and charges: Nil.

Veritys, Ltd.—Capital, £196,000 in £180,000 ordinary stock and 64,000 ordinary shares of 5s. Return dated August 11th. All stock taken up. £190,150 paid (including £13,650 premium). £3,500 considered as paid. Mortgages and charges: Nil.

George Bray & Co., Ltd.—Capital, £160,000 in 80,000 preference and 80,000 ordinary shares of £1. Return dated August 20th. 55,000 preference and 55,000 ordinary shares taken up. £7 paid. £109,993 considered as paid. Mortgages and charges: £40,000.

Aron Electricity Meter, Ltd.—Capital, £350,000 in £151,936 stock and 198,064 shares of £1 each. Return dated November 13th. £151,936 stock taken up. £75,968 paid, plus £28,692 15s. premium. £75,968 considered as paid. Mortgages and charges: Nil.

Radio Gramophone Development Co., Ltd.—Capital, £25,000 in 25,000 ordinary shares of £1 each. Return dated August 7th. All shares taken up. £36,250 paid (including premiums of £11,250). Mortgages and charges: Nil.

Birmingham Electric Furnaces, Ltd.—Capital, £1,000 in £1 shares. Return dated September 8th. All shares taken up. £1,000 paid. Mortgages and charges: Nil.

Charles Payne, Ltd.—Capital, £2,500 in 2,500 shares of £1 each. Return dated December 21st. 2,100 shares taken up. £600 paid. £1,500 considered as paid. Mortgages and charges: Nil.

Besst Electrics, Ltd.—Capital, £1,000 in £1 shares. Return dated July 18th (filed September 29th). 600 shares taken up. £600 paid. Mortgages and charges: Nil.

Tungwire, Ltd.—Capital, £6,000 in 4,000 preference and 2,000 ordinary shares of £1. Return dated December 11th. All shares taken up. £6,000 paid. Mortgages and charges: £5,000.

Companies to be Struck off the Register

The names of the following companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary:—Arctic Fan & Electrical Co., Ltd.; Gambrell Radio Communications, Ltd.; London Radio Development & Services, Ltd.

Increases of Capital

Kempston Electrical Co., Ltd.—The nominal capital has been increased by the addition of £1,500, in £1 ordinary shares, beyond the registered capital of £500.

Instrument Erectors, Ltd.—Nominal capital increased by the addition of £1,900 in £1 ordinary shares beyond the registered capital of £100.

Mortgages and Charges

S. Lightfoot, Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated January 20th, 1943, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Percivall's Radio, Ltd.—Particulars filed of debentures authorised January 18th, 1943, to secure £100 with a premium of 20 per cent., charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

British Insulated Cables, Ltd.—Satisfaction to the extent of £700,000 on December 31, 1942, of trust deed dated July 15, 1924, and registered July 30, 1924, securing £1,000,000 5 per cent. debenture stock.

Winding-up Order

In the Companies' Winding-up Court, Chancery Division, last week, Mr. Justice Bennett had before him a petition for the compulsory winding-up of Electrical Utilities, Ltd. The judgment creditors' petition was for a sum of £40, but there were supporting creditors for over £2,000 and another large amount. His Lordship made an order for the compulsory winding-up of the company.

Liquidations

Brighouse Radio Service & Equipment Co., Ltd.—Winding-up voluntarily. Liquidator, Mr. F. V. Lambert, 5, Fountain Street, Halifax.

Bankruptcies

D. G. Lee, electrician, 240B, Clapham Road, London, S.W.9.—Application for discharge to be heard on March 2nd at Bankruptcy Buildings, Carey Street, London, W.C.2.

STOCKS AND SHARES

TUESDAY EVENING.

STOCK Exchange quotations are in most cases well maintained, and although the volume of business shows contraction as compared with that of two or three weeks ago, the firmness of prices continues to be a feature. The Home Railway dividend season has started, and the first announcement, that from the L.M.S., showing an increase of 10s. per cent. upon last year's distribution, led to renewed hopefulness in regard to others in the same group. The shares in electrical manufacturing and equipment companies remain in demand. Money is flowing into Stock Exchange markets, though not perhaps at the same rate as it would be doing were it not for the near approach of " Wings for Victory " weeks.

Home Railway Dividends

The Home Railway market developed fresh accession of strength as optimistic estimates came into circulation respecting possible dividend payments for 1942. The London, Midland & Scottish dividend of 2½ per cent. for 1942 surprised as well as pleased stockholders. Estimates were promptly revised of the possible dividend on London Passenger Transport " C " stock. It is due to be declared on Thursday in this week, and will go against 2⅞ per cent. for 1941. Some people think 3 per cent. will be decided upon: others look for a higher rate. The price of the stock remains at 60. Southern preferred stock has risen ½ to 78½. In the prior-charge list, prices are extremely steady.

Thomas Tilling

The annual report of Thomas Tilling, Ltd., up to December 31st last, is more interesting than usual in that it is the first balance sheet to be issued after the rearrangement of share interests in provincial omnibus undertakings. Thomas Tilling's interests were exchanged for a holding in Tilling Motor Services, and the Tilling portion is represented by £1,998,414. The present balance sheet takes no credit for any income on the ordinary shares held in Tilling Motor Services, because up to December 31st last a dividend had not been declared. The Tilling dividend, as already announced, is 10 per cent. and the price of the shares at 54s. 6d. gives a return of £3 13s. 3d. per cent. The balance sheet is, however, so strong, and the company occupies a position of such stability, that the shares rank amongst gilt-edged ordinary issues.

The Thomas Tilling meeting takes place on Thursday in this week, February 18th, and the chairman, Sir Frederick Heaton, confessing himself a firm believer in a policy of private enterprise so far as industry generally is concerned, admits that, whether we like it or not, the subject of nationalisation of transport either by the Government or a public authority will no doubt become a live issue before long.

Price Fluctuations

The changes in our price-lists this time are few by comparison with those of the weeks recently passed. More of the preference shares in the electricity supply market have moved up by about 6d. apiece, and the ordinary shares are better where any change has occurred. City Lights and County ordinary are 6d. higher. Bournemouth & Poole rose $\frac{1}{16}$ to 61s. 3d. The Indian group maintains the strength it developed last week. Cable stocks are placid, but the market is a good one and Cable & Wireless ordinary at 77 are 10s. up. Globe Telegraph ordinary at 34s. have gained 1s. The preference keep at about 28s.; a few weeks ago the prices of ordinary and preference were the same. Anglo-American preferred responded to a little investment demand by rising a point to 113½. Oriental Telephones at 38s. are 1s. lower.

Miscellaneous Matters

Local demand has caused a rise in Bristol Trams to 52s., at which price the yield is under 4 per cent. The level 4 per cent. return can be obtained from the deferred stock of British Electric Traction, provided it becomes available at 1125, the middle price. Rio Tramway 5 per cent. bonds are up 2 points at 105½ and Brazilian Tractions after a dip to 22 recovered to 23¼. Tokyo Electric sixes have shed 1, at 18½.

Manufacturing and Equipment

Joseph Lucas shares are 3s. 3d. higher at 73s. 3d., this being one of the principal changes in their section. International Combustions have advanced 5s. to 6½. Increases have raised Johnson & Phillips to 67s. 6d., Siemens to 32s. 6d. and the 10 per cent. preference to 42s. 3d. General Electrics are better at 68s. 6d., Telegraph Constructions at 47s. 6d. and Hall Telephones at 24s. 3d. Allen West moved up to 7s. Mather & Platt at 48s. 3d. are unaffected by the announcement of a special bonus of 1 per cent. tax free in addition to the dividend of 10 per cent.

Brush Electrical

That the Brush Electrical Engineering Co. will pay an increase above the 6 per cent. dividend distributed for last year is taken for granted, and this anticipation explains why the shares give a yield, at the present price of 7s. 9d., of less than 4 per cent. on the money. The company has issued a notice to holders of the options which expire on

(*Continued on page* 272)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price Feb. 16	Rise or Fall	Yield p.c. £	s.	d.
Home Electricity Companies							
Bournemouth and Poole	12½	12½	61/3	+⅓	4	1	7
British Power and Light	6	6	29/6	..	4	1	4
City of London ..	7	7	32/6	+6d.	4	6	2
Clyde Valley ..	8	8	41/6	..	3	17	0
County of London	8	8	42/6	+6d.	3	15	2
Edmundson's:							
7% Pref. ..	7	7	34/-	..	4	2	4
Ord.	6	6	29/-	..	4	2	9
Elec. Dis. Yorkshire	9	9	45/6	+1/-	3	19	0
Elec. Fin. and Securities ..	12½	12½	51/-	+2/-	4	18	1
Elec. Supply Corporation ..	10	10	46/6	..	4	6	0
Isle of Thanet ..	2	Nil	16/-	..		—	
Lancs. Light and Power	7½	7½	37/6	..	4	0	0
Llanelly Elec. ..	5½	5½	22/6	..	4	17	9
Lond. Assoc. Electric	4½	4	24/-	..	3	6	8
London Electric ..	6	6	27/-	..	4	9	0
London Power Red. Deb.	5	5	105½	..	4	14	7
Metropolitan E.S.	8	8	42/-	..	3	16	2
Midland Counties	8	8	41/6	..	3	17	0
Mid. Elec. Power..	9	9	44/-	..	4	1	9
Newcastle Elec. ..	7	7	31/-	..	4	10	5
North Eastern Elec. Ordinary ..	7	7	35/-	..	4	0	0
7% Pref. ..	7	7	34/6	..	4	1	2
Northampton ..	10	10	47/6	..	4	4	0
Notting Hill 6% Pref. (£10) ..	6	Nil	9¾	..		—	
Northmet Power: Ordinary ..	7	7	39/6	..	3	11	0
6% Pref. ..	6	6	32/-	..	3	15	0
Richmond Elec. ..	6	6	27/-	..		—	
Scottish Power ..	8	8	41/-	..	3	18	0
Southern Areas ..	5	5	23/6	..	4	5	0
South London ..	7	7	26/-	..		—	
West Devon ..	5	5	22/6	..	4	9	0
West Glos. ..	4½	3½	21/6	..	3	5	2
Yorkshire Elec. ..	8	8	42/-	..	3	16	2
Overseas Electricity Companies							
Atlas Elec. ..	Nil	Nil	5/-	..		—	
Calcutta Elec. ..	7*	7*	35/-	..		—	
Cawnpore Elec. ..	10	10	28/-	..	7	2	10
East African Power	7	7	31/-	..	4	10	4
Jerusalem Elec. ..	7	5	24/-	..	4	3	4
Kalgoorlie (10/-)..	7½	5	9/-	..	5	11	1
Madras Elec. ..	6*	4*	24/6	..		—	
Montreal Power ..	1½	1½	29	..	5	3	5
Palestine Elec. "A"	Nil	4*	31/-	..	2	11	8
Perak Hydro-elec.	6	7	9/6	..		—	
Shawinigan Power	83cts.	90cts.	19½	..		—	
Tokyo Elec. 6% ..	6	6	18½	−1		—	
Victoria Falls Power	15	15	78/9	..	3	16	4
Whitehall Inv. Pref.	5	5	22/-	−1/-		—	

Company	Dividend Previous	Dividend Last	Middle Price Feb. 16	Rise or Fall	Yield p.c. £	s.	d.
Public Boards							
Central Electricity:							
1955-60 (Civil Defence) ..	—	3	99	..	3	0	7
1955-75 ..	5	5	116	..	4	6	2
1951-73 ..	4½	4½	108	..	4	3	4
1963-93 ..	3½	3½	104	..	3	7	3
1974-94 ..	3¼	3¼	101	..	3	4	4
London Elec. Trans. Ltd.	2½	2½	96½	..	2	11	10
London & Home Counties 1955-75	4½	4½	110	..	4	1	10
Lond. Pass. Trans.:							
A	4½	4½	123½	..	3	13	0
B	5	5	121½	..	4	2	4
C	3	2¾	60	..	4	15	4
West Midlands J.E.A. 1948-68 ..	5	5	110	..	4	11	0
Telegraph and Telephone							
Anglo-Am. Tel.:							
Pref.	6	6	113	+1	5	5	9
Def.	1½	1½	29	..	5	3	5
Anglo-Portuguese	8	8	25/-	−6d.	6	8	0
Cable & Wireless:							
5½ Pref. ..	5½	5½	113	..	4	17	4
Ord.	4	4	77	+½	5	4	0
Canadian Marconi $1	Nil	4cts.	7/3	..	2	8	0
Globe Tel. & Tel.:							
Ord.	8¼*	5*	34/-	+1/-	2	18	10
Pref.	6	6	28/-	..	4	5	9
Great Northern Tel.: (£10)	Nil	Nil	24	−½		—	
Inter. Tel. & Tel...	Nil	Nil	7	..		—	
Marconi-Marine ..	7½	7½	32/6	..	4	12	4
Oriental Tel. Ord.	16	10	38/-	−1/-		—	
Telephone Props.	6	Nil	14/-	..		—	
Tele. Rentals (5/-)	10	10	11/-	..	4	11	0
Traction and Transport							
Anglo Arg. Trans.: First Pref. (£5)	Nil	Nil	5/-	..		—	
4% Inc. ..	Nil	Nil	15	+1		—	
Brit. Elec. Traction: Def. Ord. ..	45	45	1125	+25	4	0	0
Pref. Ord. ..	8	8	170	..	4	14	2
Bristol Trams ..	8	10	52/-	+1/6	3	17	1
Brazil Traction ..	$1½	$1	22½	−½		—	
Calcutta Trams ..	8	5½	21/6	..	5	2	4
Cape Elec. Trams	5	5	22/6	..	4	9	0
Lancs Transport..	10	10	43/3	..	4	12	4
Mexican Light: 1st Bonds ..	5	5	97½	..	5	2	7
Rio 5% Bonds ..	5	5	105½	+2	4	14	9
Southern Rly.: 5% Prefd. ..	5	5	78½	+½	6	5	9
5% Pref. ..	5	5	117	..	4	5	6
T. Tilling	10	10	54/6	+9d.	3	13	4
West Riding ..	10	10	40/-	..	5	0	0

(*Continued on next page*)

*Dividends are paid free of Income Tax

Company	Dividend Previous	Dividend Last	Middle Price Feb. 16	Rise or Fall	Yield p.c. £ s. d.
Equipment and Manufacturing					
Aron Elec. Ord. ..	7½	10	40/–	..	5 0 0
Assoc. Elec. :					
Ord.	10	10	50/6	..	3 19 0
Pref.	8	8	40/–	..	4 0 0
AutomaticTel.&El.	12½	12½	56/–	+6d.	4 9 3
Babcock & Wilcox	11	11	50/6	..	4 7 2
British Aluminium	10	10	49/–	−6d.	4 1 8
British Insul. Ord.	20	20	5⅝	..	3 17 3
British Thermostat (5/–)	18½	18½	17/6	..	5 5 9
British Vac. Cleaner (5/–)	10	15	21/6	..	3 9 9
Brush Ord. (5/–)	Nil	6	7/9	..	3 17 5
Callender's ..	15	15	80/9	..	3 13 6
ChlorideElec.Storage	15	15	76/3	..	3 18 9
Cole, E. K (5/–)	7	10	21/3	..	2 7 0
Consolidated Signal	17	17	106/3	..	3 4 5
Crabtree (10/–) ..	17½	17½	38/6	..	4 11 0
Crompton Parkinson Ord. (5/–) ..	30	20	26/–	..	3 17 0
E.M.I. (10/–) ..	6	6	21/6	−6d.	2 15 9
Elec. Construction	10	10	42/6	..	4 14 1
Enfield Cable Ord.	12½	12½	58/6	+6d.	4 5 6
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric ..	10	10	47/6xd	..	4 4 0
Ensign Lamps(5/–)	25	25	18/9	..	6 13 4
Ericsson Tel. (5/–)	22*	20*	47/6	..	2 2 2
Ever Ready (5/–)	40	40	39/–	..	5 2 7
Falk Stadelmann	7½	7½	26/–	..	5 15 5
Ferranti Pref. ..	7	7	28/9	..	4 17 5
G.E.C. :					
Pref.	6½	6½	33/3	..	3 18 4
Ord.	20	17½	88/6	+1/–	3 19 2
Greenwood & Batley	15	15	36/6	..	8 4 4
HallTelephone(10/–)	10	12½	24/3	+6d.	5 3 3
Henley's (5/–) ..	20	20	25/9	..	3 17 6
4½% Pref. ..	4½	4½	23/–xd	+3d.	3 18 3
Hopkinsons ..	15	15	57/–	..	5 5 3
India Rubber Pref.	5½	5½	20/–	..	5 10 0
Intl. Combustion	32½	30	6¼	+¼	4 16 0
Johnson & Phillips	15	15	67/6	+1/6	4 8 9
Lancashire Dynamo	20	20	4	..	5 0 0
Laurence,Scott(5/–)	15	12½	10/–	..	6 5 0
London Elec. Wire	7½	7½	30/–	..	5 0 0
Lucas, J.	15	15	73/3	+3/3	4 2 0
Mather & Platt ..	10	10	48/3	..	4 3 2
Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
Murex	20	20	5¾	−¼	3 15 0
Pye Deferred (5/–)	25	25	21/3	..	5 17 8
Revo (10/–) ..	20	17½	35/6	..	4 18 7
Reyrolle	12½	12½	65/–	..	3 17 0
Siemens Ord. ..	7½	7½	32/6	+1/6	4 12 4
Smith, S. (1/–) ..	50	37½	9/3	−6d.	4 1 1
Strand Elec. (5/–)	4	7½	7/3	..	5 3 5
Switchgear & Cowans (5/–) ..	15	10	13/6	.	3 14 1
T.C.C. (10/–) ..	5	5	15/–	..	3 6 8
T.C. & M... ..	10	10	47/6	+6d.	3 13 7
Telephone Mfg.(5/–)	9	9	11/6	..	3 18 3
Thorn Elec. (5/–)	20	20	19/3	..	5 4 0
Tube Investments	23¾	20	93/–	..	4 6 0
Vactric (5/–) ..	Nil	Nil	11/6	+6d.	—
Vickers (10/–) ..	10	10	20/–	..	5 0 0
Ward & Goldstone (5/–)	20	20	22/–	..	4 11 0
Westinghouse Brake	10	12½	63/6	−9d.	3 18 9
WalsallConduits(4/-)	55	55	42/–	−6d.	5 4 9
West, Alien (5/–)	7½	7½	7/–	+6d.	5 7 2

* Dividends are paid free of Income Tax.

Stocks and Shares (*Continued from page* 270)

September 30th next. Holders who propose to exercise the option, says the company's notice, are advised to consult a bank or stockbroker. This evidently refers to the fact that, in order to rank for the forthcoming dividend, shares which are issued under option must be called and paid for in the near future. The price of the option is 10s. 6d., which closely corresponds to the current price of the existing shares.

Whitehall Electric

Whitehall Electric 7½ per cent. preference have gone back 1s. to 22s. in spite of calculations that the shares should be worth at least 23s. if the capital reorganisation plan goes through. The plan, already set out here, at first sight looks somewhat complicated. Those who assent are to receive new preference shares, new ordinary, and a certain amount of cash. To the average shareholder, financial complications are frequently distasteful. He would sooner sell his shares than start upon some fresh line of investment that offers, in exchange for what he already holds, a different shape of security. This is what has happened in the Whitehall Electric case and, until the scheme is passed and the new stocks become familiar, the present 7½ per cents. are likely to remain dull.

Preference *v.* Ordinary

The conflict between the claims of preference shares and those of ordinary shares to the investors' attention becomes more and more pronounced as the prices of ordinary shares steadily approach the standard of yield that attaches to the senior class. To some people, indeed, the ordinary share makes a greater appeal than the preference does. A preference dividend is generally fixed at a certain rate, beyond which no increase is possible. It is argued that an ordinary share does stand at least a chance of obtaining a higher rate of dividend as a consequence of additional earnings and expansion of business. So long as E.P.T. remains at its present level expansion of dividends on ordinary shares can hardly be anticipated save in exceptional cases. But, looking ahead, investment sees the possibilities that open to increased value after the war and, with this in view, will not infrequently prefer a good ordinary share to the preference issue in the same company.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

AKTIEBOLAGET Separator.—" Centrifugal separators." 9388/41. July 2nd, 1940. (550846.)

Automatic Telephone & Electric Co., Ltd., and S. R. Smith.—" Windows, particularly for indicating instruments or the like." 9232. July 22nd, 1941. (550804.)

J. Beresford & Son, Ltd., and R. L. Gold. " Dynamo-electric machines." 9545. July 28th, 1941. (550929.)

F. J. G. Van Den Bosch and Vacuum-Science Products, Ltd.—" Closure members for vacuum tubes." 9490. July 25th, 1941. (550856.)

British Insulated Cables, Ltd., and P. Eckersley.—" Electricity meters." 11376. September 5th, 1941. (550881.)

British Thomson-Houston Co., Ltd.—"Electric arc extinguishing apparatus." 12723/41. October 2nd, 1940. (550819.) " Electric transformers." 9148/41. July 19th, 1940. (550869.) " Reflectors." 13459/41. October 22nd, 1940. (550887.) " Thermal demand meters." 14/42. January 4th, 1941. (550905.) " Means for controlling the voltage applied to alternating current load circuits." 6682/41. May 25th, 1940. (550918.)

British Thomson-Houston Co., Ltd., H. K. Bourne and I. L. Fowler.—" Electric-discharge lamps." 13737. October 25th, 1941. (550820.)

B.T.H. Co., Ltd., and A. T. Stretton.—" Electro-hydraulic operating mechanism." 15448. December 1st, 1941. (550824.)

Brookhirst Switchgear, Ltd., and J. H. Barnes.—" Dash pots." 9363. July 24th, 1941. (550924.)

J. D. Cockcroft and R. E. Ridsdale.—" Electric valve holders." 8953. July 15th, 1941. (550922.)

J. A. Crabtree & Co., Ltd., H. F. McLoughlin, W. E. Hill, R. W. Morgan and T. D. G. Wintle. " Electrical wiring systems." 2215/42. October 6th, 1941. (Divided out of 12883/41.) (550936.)

Duratube & Wire, Ltd., and J. Veit.—" Products made of thermoplastic materials." 9283. July 23rd, 1941. (550890.)

English Electric Co., Ltd., and H. S. Carnegie.—" Power transmission by dynamo-electric machines." 9224. July 22nd, 1941. (550946.)

C. E. Every. (Electro Manganese Corporation).—" Electrolytic recovery and deposition of manganese and materials for use therein." 9337. July 23rd, 1941. (550842.)

G. R. Fountain, Ltd., H. J. Houlgate and P. D. R. Marks.—" Apparatus for testing microphones." 9737. July 31st, 1941. (550877.)

Hazeltine Corporation.—" Multiplex signal-transmitting system." 11060/41. May 28th, 1940. (550814.)

Holophane, Ltd.—" Luminairs." 4035/42. May 27th, 1941. (550910.)

Masteradio, Ltd., and R. Pollock.—" Apparatus for supplying electric current to consuming devices." 11600. September 10th, 1941. (550816.)

Mullard Radio Valve Co., Ltd., A. J. Van Hoorn and G. Thurmer.—" Vaporisation of metals." 9414. July 24th, 1941. (550848.)

Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken).—"Barrier layer rectifiers for alternating current." 2980. March 6th, 1942. (550826.) " Systems for modulating high-frequency oscillations with the suppression, at least partially, of one of the side bands." 12965. October 7th, 1941. (550899.) " Cutting means for use in dry-shaving apparatus." 16375. December 18th, 1941. (550903.) " Push-pull amplifying circuits." 526. January 13th, 1942. (550907.) " Devices for measuring direct-current voltages of small value." 1622. February 6th, 1942. (550909.)

Pirelli-General Cable Works, Ltd., and H. Barron.—" Process for the continuous vulcanisation of rubber or the like." 11405. September 6th, 1941. (550895.)

Seymour Corporation of Delaware.—" Circuit-breaking mechanism." 9950/41. August 3rd, 1940. (550894.)

T. B. Somerville and Metropolitan-Vickers Electrical Co., Ltd.—" Damping of electric regulators." Cognate applications 7945/41 and 8687/42. June 24th, 1941. (550834.)

Standard Telephones & Cables, Ltd.—" Reduction of cross talk." 5884/42. April 26th, 1941. (550912.)

W. Stern.—" Staff-locating systems." 12761. October 2nd, 1941. (550934.)

E. T. J. Tapp, F. J. G. Van Den Bosch, and Vacuum-Science Products, Ltd.—" Radio apparatus for indicating the distance of a remote object." 9264. July 22nd, 1941. (550808.)

Venner Time Switches, Ltd., W. F. Horgan and L. W. Fox.—" Detent and clutch devices for use in synchronous electric motor mechanisms and for other purposes." 9595. July 28th, 1941. (550809.)

Walsall Conduits, Ltd., and E. Gough.—" Tumbler switches." 10874. August 26th, 1941. (550812.)

Westinghouse Brake & Signal Co., Ltd., and R. M. MacGregor.—" Code-transmitting apparatus for signalling systems." 2831. March 3rd, 1941. (550917.)

Westinghouse Brake & Signal Co., Ltd., and C. F. D. Venning.—" Railway traffic controlling apparatus." 2257. February 19th, 1941. (550862.)

Westinghouse Electric International Co.—" Control system for vapour electric discharge devices." 9385/41. August 2nd, 1940. (550872.)

Chadwick Public Lectures

On Tuesday, February 23rd, at 2.30 p.m. the first lecture in the spring programme of Chadwick public lectures is to be given at the London School of Hygiene and Tropical Medicine, W.C.1, when Professor M. Greenwood is to speak on " Social and Industrial Environment and Disease." Sir William J. Collins, chairman of the Chadwick Trustees, is to preside. Admission to all the lectures is free.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—COMMONWEALTH.—P.M.G.'s Department. March 16th. B.P.O. uniselector parts (Sch. C.4015) and handsets (Sch. C. 4041).
March 23rd. Resistances and reactances (Sch. C.4008).
March 30th. Testing instruments, exchange service type (Sch. C.4036).
April 1st. Testing instruments, insulation and resistance testers (Sch. C.4035).
April 8th. Jacks (Sch. C.4016).
(See February 5th for other items.)

Belfast.—February 24th. Electricity Department. Stores, including electrical material (February 5th).

Irlam.—February 27th. Urban District Council. Lamps for the year ending March 31st, 1944. Forms of tender from the engineer and surveyor, Council Offices.

Londonderry.—March 1st. Town Council. House service cut-outs, joint box compound, meters, electrical accessories, electric kettles, transformers and kiosks, cables and cable covering tiles. Specifications, etc., from the borough electrical engineer.

Newcastle-on-Tyne.—City Council. Electrical installation in C.2 depot. Plans by J. F. C. Solomon, city estate and property surveyor, Town Hall.
Repairs to electrical installations in Council houses during six months commencing April 1st. Plans by R. G. Roberts, City Housing Architect, 18, Cloth Market.

Plymouth.—February 26th. Electricity Department. Alkaline battery. (See this issue.)

Orders Placed

Newcastle-on-Tyne.—City Council.—Accepted. Electrical installation at C.3 depot (£123).—Sleigh and Wood.

Sunderland.—Corporation.—Accepted. Pressure switch (£317).—A. Reyrolle & Co. Electric cables.—Edison Swan Cables; Aberdare Cables.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barnstaple.—Completion of 50 houses; borough engineer, The Castle.

Bishop Auckland.—Bus station for United Automobile Services, Ltd., Darlington, and O.K. Bus Services, Ltd.

Crook and Willington (Durham).—Houses; U.D.C. architect.

Derbyshire.—Alterations to school at Whitwell (£6,300); J. Harrison, county architect, St. Mary's Gate, Derby.

Gateshead-on-Tyne.—Factory on the Team Valley Trading Estate. Also conversion of factory into bakery and additions and alterations to factories A 81 and G 97; North-Eastern Trading Estates, Ltd.

Glasgow.—New seamen's institute at Gareloch (£6,000); secretary, Missions to Seamen, Glasgow.

Greenock.—Houses; burgh surveyor.

Hebburn-on-Tyne.—Extensions to works canteen; Hawthorn, Leslie & Co., Ltd.

Hereford.—Additions to works, Widemarsh Street, Fryer's Garages, Ltd.; H. P. King, architect, 121, Colmore Row, Birmingham, 3.

Isle of Wight.—Nursery, Newport, and central kitchen, Gurnard Road, Cowes; county architect.

London.—A.R.P. depot (£13,000); Metropolitan Water Board engineer.
GREENWICH.—Nursery (£2,500); C. H. Jennings, borough engineer, Town Hall, Greenwich, S.E.10.

Manchester.—Additions to premises, Thomas Street and Shudehill, for J. Brooks & Co., Ltd., agricultural engineers; H. S. Fairhurst & Son, architects, 55, Brown Street.

Mansfield.—Dairy and warehouse, Southwell Road; G. Mawer & Sons, Ltd., dairymen, 95, Southwell Road West.

Miles Platting.—Boiler house and store; Evans, Bellhouse, Ltd., timber merchants, 761, Oldham Road, Manchester, 10.

Newbury.—British Restaurant, Northcroft (£2,624); Eggleton & Tallyn, contractors, Berkeley Road.

Northenden.—Additions to factory; A. A. G. Toone, architect, 37, Princess Street.

North Cotswold.—Houses at Mickleton for R.D.C.; J. E. Busfield, surveyor, Moreton-in-Marsh.

Salford.—Saw mill; Mallinson & Eckersley, Worsley Street.

Somerset.—School kitchens at Keynsham (£1,437), Wells (£1,402) and Wiveliscombe (£1,359); county architect, Park Street, Taunton.

Stafford.—Extensions to nurses' home; secretary, Staffordshire General Infirmary, Stafford.

Stockport.—Nursery, Heaton Norris (£2,513); C. & O. Hallett, builders, Apsley Street.
Additions to works; North Western Road Car Co., Ltd., 120, Charles Street.
Office and store; G. Durrant & Sons, Ltd., Bury Street.

Watergate Colliery (Durham).—Canteen; R. C. Williamson, Strathmore Road, Rowlands Gill.

West Yorkshire.—Five additional miners' canteens; Architect's Dept. Miners' Welfare Commission, Ashley House, Ashtead, Surrey.